Dental Digest

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Vol. 64, No. 7

Dental Digest

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JULY 1958

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The magazine is mailed on the fifteenth of the month of issue.

The Air-driven TURBINE HANDPIECE: *Its Application to the* FULL CROWN *Preparation*

ROBERT L. JACOBSON, B.S., D.D.S., Staten Island, N. Y.

DIGEST

The amount of interest at present exhibited by dental practitioners and manufacturers of dental equipment reveals a definite trend toward the high and ultrahigh speeds in dental cutting operations. Since June, 1957, the author of this article has been routinely using one of the air-driven turbine type handpieces available. From the first day of its installation, the ultraspeed handpiece has relegated the conventional belt-driven handpiece to an auxiliary position, its use limited to prophylaxis and other minor procedures. The airotor has made it possible to achieve better dentistry with greater ease, more comfort, and a substantial reduction in operating time. In addition, the patients' acceptance of this handpiece has been as enthusiastic as the dentist's. The advantages and disadvantages of the instrument are enumerated in this article and step-by-step directions are given for its use in full crown preparation.*

Operation

This equipment utilizes compressed air as its motive power:

(1) Air is supplied from the compressor to a control unit which filters it and then regulates the pressure.

(2) The air then flows through an oiler which provides a small amount of lubricant to be added to the air stream in the form of a fog or mist. This lubricant is carried by the air to the bearings, which are thereby constantly lubricated.

(3) The air is carried through the connecting tube and a tube in the sheath of the handpiece, and is then directed against the blades of the ball bearing-mounted rotor, causing the latter to turn at immense speed. This rotor, by means of a plastic chuck, holds the cutting instrument.

Maximum Speed Available— The rotational speeds achieved, utilizing the maximum available air pressure, are in the neighborhood of 250,000 to 280,000 revolutions per minute.

Cooling Device Incorporated — A built-in water coolant supply directs a stream of water on the cutting surface of the bur or stone being used. This stream is converted into a spray by means of the exhausted air and by centrifugal force resulting from the spinning bur. A dual switch makes it possible to operate either with or without the spray.

Advantages and Disadvantages

Use of the air-driven handpiece provides the following advantages:

1. *Increased Accuracy* — The bur or stone that is being used is firmly held by the plastic chuck, which prevents lateral play or "bur wobble." This means that the cutting instrument can be directed at any part of the tooth and it will cut only where placed and not skip, jump, or move to another part of the tooth. For example, placing the end of a fissure bur on the shoulder of a crown preparation will result in an extremely smooth surface in the area over which the bur is moved. This is accomplished without nicking other parts of the preparation or slipping off on to the gingiva.

2. *Low Torque*—Light pressure is required in handling this instrument; in fact, heavy pressure will cause it to stop. The result of being able to perform cutting operations without applying heavy (or even moderate) pressure on the handpiece is increased safety as there is much less danger of the handpiece being misdirected. If a patient, as happens with children, should suddenly close his mouth on the handpiece during an operation, the bur will instantly stop rather than be driven deeply into the tooth. It has also been noticed that this instrument will do less damage to the oral soft tissues than high torque handpieces.

3. *Ease of Cutting*— Due to the high rotational speed of the handpiece, all substances commonly found in the mouth can be cut relatively easily. If deemed more convenient, for instance, dentures can be spot ground without being removed from the mouth. In adjusting gold crowns, a smooth fissure bur not only will remove the high spots, but will leave a carved, smooth surface. Amalgam seems to melt away and the natural tooth structure is cut without effort.

4. *Absence of Vibration* — The absence of perceptible vibration is a benefit to both the operator and the patient. Since the patient's threshold of perception of vibration is greatly surpassed, he experiences much more comfort throughout the procedure. From the point of view of the operator, less fatigue results from holding a smoothly running instrument.

5. *Ultrahigh Speed*—In addition

*Borden Airotor

to making it possible to cut a greater variety of materials with ease, the speed of rotation of this handpiece shortens the time required to perform the various cutting operations. In a preliminary study conducted by the author in which the total running time of the handpiece was tabulated by a timer, 193 surfaces of amalgam preparations performed on 105 patients required an average of approximately 40 seconds per surface. Full crown and porcelain jacket preparations ranged between 6 and 9 minutes each. It should be pointed out that no effort was made to do this work as rapidly as possible, but rather, accuracy and attention to detail received primary attention. Nevertheless, these results represent a great decrease in operating time and are indicative of the rapidity at which tooth structure is removed.

6. *Greater Versatility of Instruments*—Because of the ease with which the various burs and stones cut, each individual bur or stone has a wider range of use. This results in a smaller variety of instruments being necessary to provide a well rounded selection. A total of 10 to 12 different carbide burs and diamond stones are all that are required by the average practitioner as basic stock.

7. *Ease of Maintenance* — As the bearings of the airotor are automatically and constantly lubricated, there is no need for additional lubrication. The inconvenience, disorder, and time loss resulting from the frequent cleaning and lubrication usually required of the conventional handpiece and contra-angle are completely eliminated.

8. *Absence of Interference with Conventional Handpiece* — Since this apparatus is contained in a separate unit, the changing of handpieces or the need for a dual arm set-up is

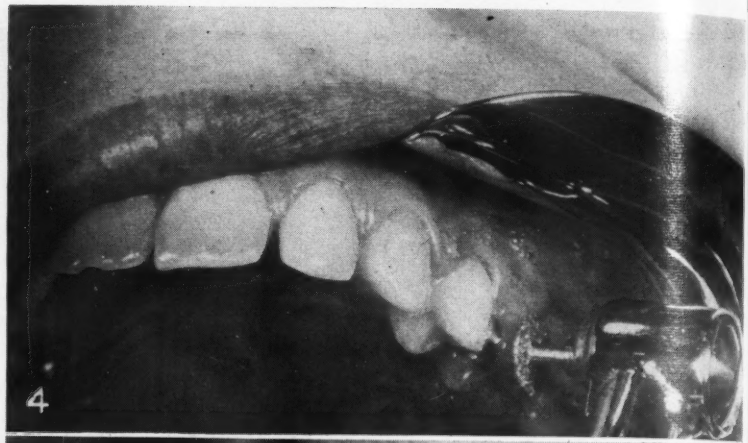
1. ***The instruments used in the full crown preparation; a diamond wheel, a tapering diamond point, and the No. 57 carbide bur.***

2. ***Preoperative view of upper second bicuspid: buccal view.***

3. ***Preoperative view of tooth: mirror aspect.***

eliminated. Thus it is possible to transfer from the use of the airotor to the conventional handpiece as quickly as one can be put down and the other picked up.

9. *Life Span and Ease of Repair*—The indications are that the life span of a rotor far exceeds that of the average contra-angle, although the air-driven turbines have not been in general use long enough to make more accurate data possible. Based on early studies on the laboratory bench and in clinical use, it has been estimated that, with average use, a rotor should last between 10½ months and a year. An important difference, however, is that the airotor does not gradually lose its accuracy or efficiency over its life span as does the conventional contra-angle. When the airotor's bearings do burn out, they burn quickly. It is then a relatively simple and quick procedure to change the entire rotor unit in the office, thus eliminating the loss of usage usually necessitated by returning a worn-out contra-angle to the manufacturer or supply house for repair. When office repair of the airotor is made, all the moving parts of the handpiece are changed in the one operation of replacing the rotor unit so that the end result is the same as having a brand new handpiece.



***4.** Reduction of the buccal surface of the tooth using the diamond wheel.*
***5.** Appearance of buccal surface of tooth after gross reduction of enamel with diamond wheel.*

Disadvantages

The following disadvantages of the air-driven handpiece have been noted:

1. *Low Torque*—The fact that the airotor requires an extremely light touch in its use means that the usual methods of handling a contra-angle must be discarded and a new approach learned. Since 2 to 3 ounces of hand pressure are considered optimum in handling the airotor, and approximately 9 ounces will stop it, heavy-handedness or "pressing" will not give satisfactory usage. There are no carry-over techniques in changing from the conventional handpiece to the airotor; an entirely new "feel" must be developed. This is usually the most serious obstacle to be overcome in first contacts with this new equipment.

2. *Compressor Requirements* — To operate an airotor properly a compressor must supply at least 40 pounds per square inch of pressure at one cubic foot per minute. Not only must this amount of air be available, but the compressor must be able to maintain this output over the period of use. These requirements exceed those of the average dental compressor now in use, and will require, for most offices, the purchase of a new compressor.

3. *Bur Shank Size* — The airotor uses a bur shank diameter which is smaller than that of the standard latch type bur. Since a new set of carbide burs and diamond stones are required for its use, the present supply of standard burs and stones in the office becomes obsolete for this instrument.

4. *Contra-angle Shape* — The air-driven handpieces are made only in the contra-angle shape. Although most operators do not find this inconvenient, there may be some who have a preference for the straight handpiece for certain operations.

5. *Noise Level* — The Airotor, in use, gives off a high-pitched, rather shrill sound which may prove annoying to the patient. This sound is above the level at which conversation takes place and may require changes in approach to the handling of patients. The question of damage to the auditory nerve has also been suggested and must be studied further.

Technique for Full Crown Preparation

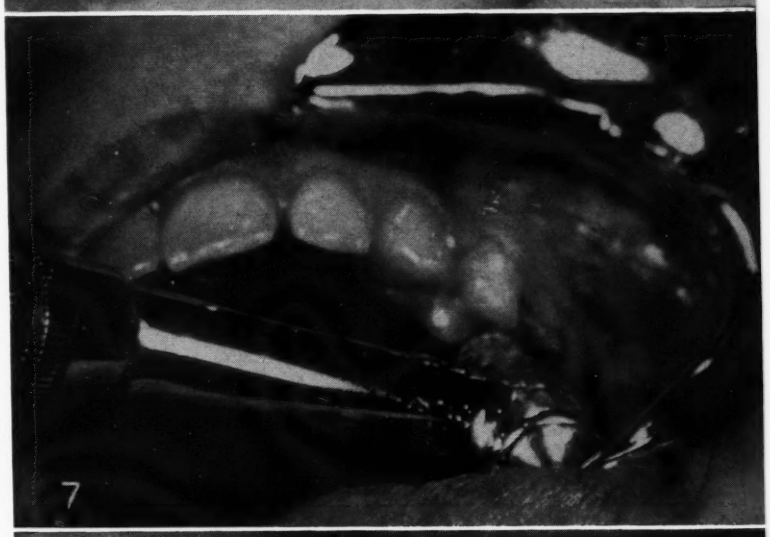
Because of the ease with which tooth structure is removed with this apparatus, many different techniques for crown preparation will be evolved. One factor that will be common to all will be the small number of different burs and stones that will be employed, as each cutting instrument has a wider range of use than it does in the conventional contra-angle. It is possible to complete a full crown preparation using only a No. 557 bur, although this is not the most convenient approach.

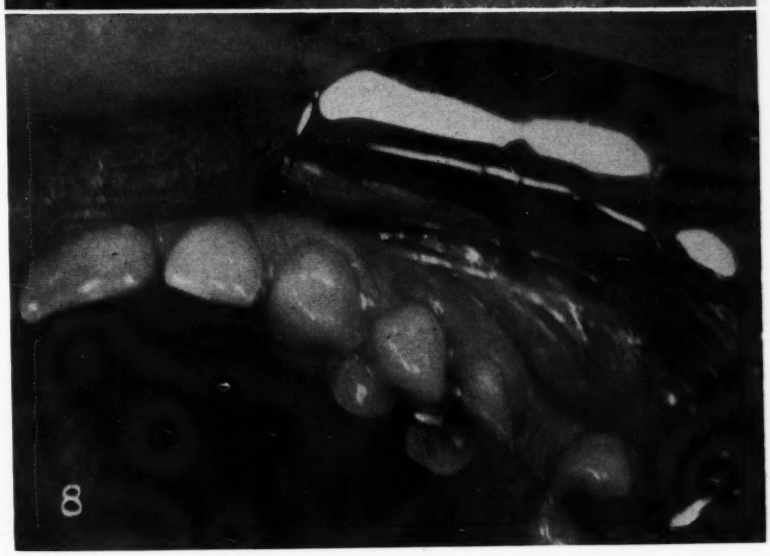
Cutting Points Employed — The technique to be described here uses three cutting points: (1) a diamond wheel ¼ inch in diameter and 1/32 inch in thickness, with three perforations in its face; (2) a tapering cylinder diamond point which is 1/16 inch at its widest diameter; and (3) a No. 57 carbide bur, which is the same size as a No. 557 bur but does not have the cross cuts on the blades (Fig. 1).

The tooth selected for demonstration of this technique is a normal upper left second bicuspid (Figs. 2, and 3). It was decided to prepare this tooth with a full shoulder as in the typical porcelain jacket preparation.

Flat Plane Achieved—The ¼-inch diamond wheel is utilized in starting the preparation. It is placed with its flat surface on the buccal aspect of the tooth and with a light brushing or wiping type of stroke, the bulge of enamel is removed (Fig. 4). By continuing this reduction, a flat plane is achieved from the gingival margin to the occlusal surface (Fig. 5). This plane should approximate the angulation of the buccal surface of the finished preparation.

Lingual Reduction—This stone is used in the same manner to accomplish the lingual reduction (Fig. 6).





6. Application of the diamond wheel to the lingual surface.
7. Application of the diamond wheel to the occlusal surface.
8. The finished first step in the preparation: flat planes on the buccal, occlusal, and lingual surfaces.

No attempt is made at this time to form a shoulder, although it is possible to do this with the edge of the stone. The reason for this is that it is much easier and less traumatic to the soft tissues to do this in the manner to be described.

Reduction of Occlusal Surface — Following the cuspal patterns of the tooth, the occlusal surface is reduced using the same surface of the same stone (Fig. 7). This operation completes the use of the wheel-shaped stone, leaving the preparation with flat planes on the buccal, lingual, and occlusal surfaces (Fig. 8). These flat planes, although they will subsequently be rounded off, act as guides for the further preparation of the tooth. Enough reduction of each surface has already been accomplished to indicate, roughly, the buccal-lingual-occlusal dimension of the finished preparation.

In certain cases, such as in the case of a particularly long tooth, it may be more expedient to start the preparation with the occlusal reduction, as this shortens the buccal surface to the point where it will not exceed the diameter of the wheel.

Second Step in Preparation—This consists of rounding off the flat planes which have been achieved, and is accomplished with the tapering cylinder diamond stone (Fig. 9). At this time the shoulder is started:

(1) The stone is held with its long axis parallel to the long axis of the preparation and is carried around the perimeter of the preparation, as far as possible without damaging the adjacent tooth. This will result in a rounded preparation, except that the interproximal areas are still unprepared.

(2) The shoulder of the preparation is also started at this time using the end of the diamond stone to cut the shoulder while the sides of the stone are preparing the axial surfaces of the tooth.

(3) At the completion of this step, the preparation begins to assume its finished shape, with the exception of the interproximal areas (Fig. 10).

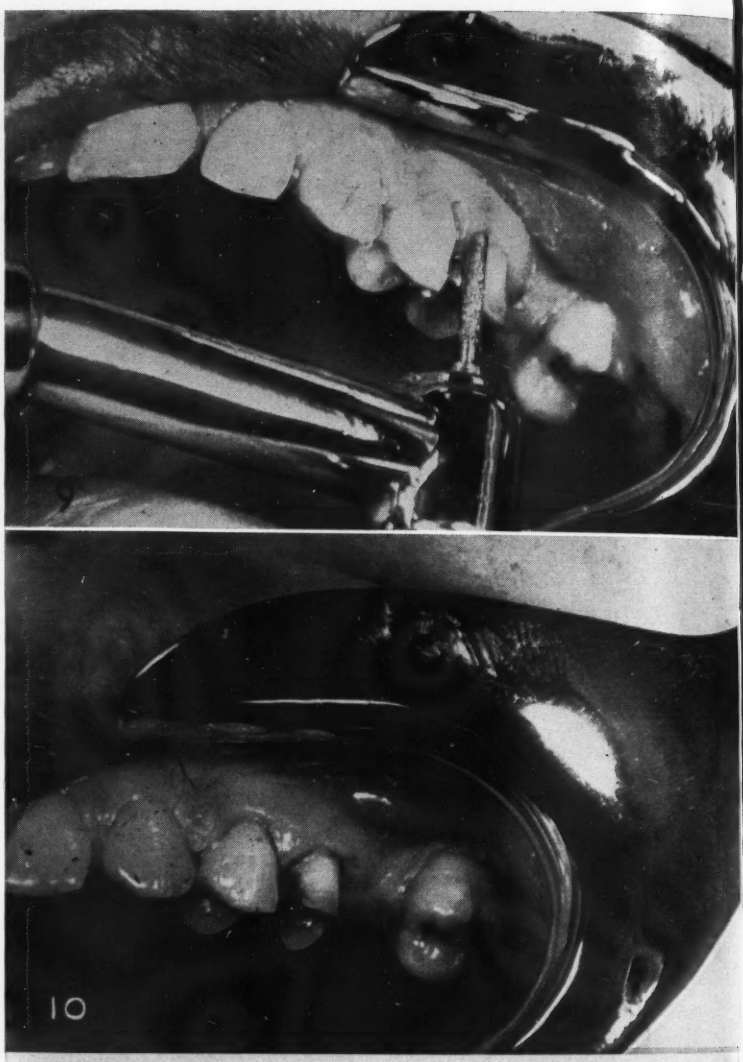
Final Instrument Used — The No. 57 bur is the final instrument used in the preparation. It is placed on the tooth in a manner similar to the previous instrument:

(1) Starting on the buccal surface, the shoulder of the preparation is completed and the reduction is carried into the interproximal area (Fig. 11).

(2) Rather than to cut the surface of the adjacent tooth, the bur passes from buccal to lingual entirely within the substance of the tooth being prepared. This is similar to the type of cut made when preparing the step in a Class II amalgam preparation.

(3) The surface of the interproximal gingiva is followed as the bur is passed through this area and the result is a smoothly reduced surface with a completed shoulder that is continuous with the preparation on the buccal and lingual surfaces.

(4) In certain preparations, such as in molars, where a broad interproximal area is encountered, it is sometimes more convenient to start the interproximal reduction by placing the bur on the buccal shoulder and



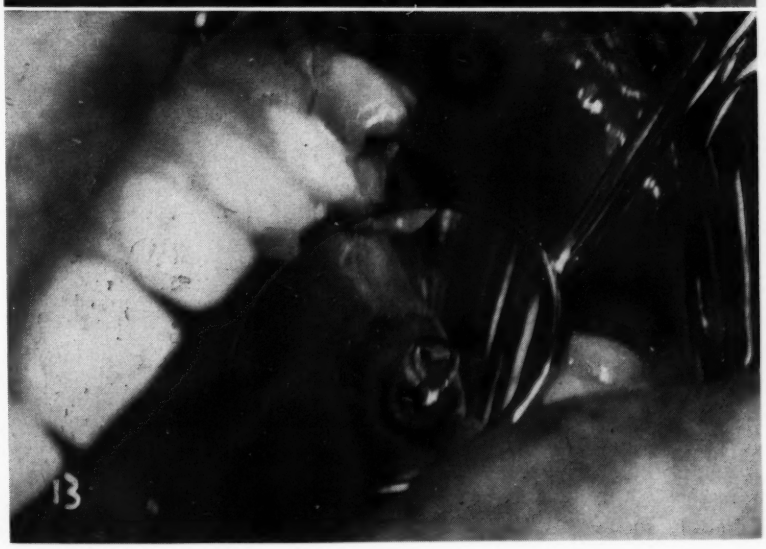
9. ***The tapering cylinder stone being used to round off the flat planes previously obtained.***
10. ***The completed second step: the preparation is rounded as much as the approximating tooth allows and the shoulder is started.***

carrying the reduction half way through the interproximal area and then transferring the bur to the lingual shoulder and proceeding interproximally until the previous cut is met.

Shoulder and Proximal Reduction Accomplished — (1) Either by starting on the buccal and going straight through to the lingual, or (2) by starting on both the buccal and lingual and meeting interproximally, the shoulder and proximal reduction of the tooth will be accomplished simultaneously. It is more advantageous to perform this part of the preparation as described previously than with a disc as greater control and accuracy are obtained. When slicing through with a disc, if the cut is terminated at the crest of the gingiva interproximally, it is short both buccally and lingually from this point. In using a bur, however, the curvature of the gingiva can be easily followed so that the resultant shoulder can be made to follow the festoon of the gingiva regardless of different heights that may be encountered. It is difficult to achieve this type of preparation with a disc, without causing undue trauma to the gingival tissues.

Sharp Line Angles Avoided—The surface that results from using the No. 57 bur is extremely smooth, giving almost a polished appearance. This is due to the fact that there are no cross-cuts on the blades and the action is similar to a carpenter's plane. Sharp axial line angles between the proximal and buccal and the lingual surfaces are also avoided as the proximal cuts are made by sweeping in from the previously finished buccal and lingual surfaces. The finished preparation can be made quite readily to assume a smooth, symmetrical shape (Figs. 12, and 13).

Variations Possible — Although it



11. ***The No. 57 carbide bur being used to finish the shoulder and the proximal part of the preparation.***
12. ***Finished preparation: buccal view.***
13. ***Finished preparation: occlusal view (mirror aspect).***

has been found that this technique will satisfy most situations, it is not difficult to apply variations to suit particular problems. Because much of the preparation can be easily accomplished with the relatively small No. 57 bur, it is possible to maneuver through difficult places without a loss of control or accuracy.

Comment

A common error made by inexperienced users of this handpiece is an attempt to shorten dramatically the time taken for a particular operation. This will lead to the use of heavy hand pressures in an attempt to push the bur quickly through the tooth. The result of heavy pressure, however, is a slowing down of the handpiece and a loss of efficiency. On the other hand if the emphasis is placed on achieving an increase in accuracy and the production of finer results, shorter operating periods will be the rule as the handpiece will be in proper use. Operating with the airotor will also lead to greater patient comfort and a substantial reduction in operator fatigue.

Summary

Dentistry has at its disposal a handpiece which makes it possible to operate conveniently at speeds in the neighborhood of 250,000 r.p.m. Utilizing compressed air as its motive power and having the ultimate bur-holding mechanism as its only moving part, these speeds are reached without creating perceptible vibration. The increase in control and ease of operation enables the operator to achieve more satisfactory results.

5952 *Amboy Road*

Enlargement of Parotid Glands

JOHN J. DUGGAN, M.D., and EARLE N. ROTHBELL, M.D.

Discussion

Noninflammatory parotid enlargement is a condition defined clinically only in a negative sense, without morphologic definition and of unknown cause and unknown pathogenesis. Yet wherever it has been described it has been associated with disturbed nutrition, which is taken here to include obesity, diabetes mellitus, and refeeding after privation, as well as inadequate diet owing to poverty or alcoholism or custom. The nutritional insult may be continuing or remote.

Significance of Protein Deficiency —Whether a common factor is operative in all cases is not known. Acute parotid enlargement has been induced in the laboratory animal, however, by manipulation of dietary protein, and circumstantial evidence has suggested to others that protein deficiency represents the common denominator in noninflammatory parotid swelling in man. Cases studied are compatible with such a concept if it is extended to include relative protein deficiency —normal protein intake in the face of excessive total calories.

Clinical Usefulness — Whatever their nature, the detection of enlarged parotid glands has been clinically useful. It has led to the review of dietary histories with the discovery of new information, notably in relation to alcoholism. Enlarged parotid glands are strongly suggestive of associated liver disease, and they provide an indication for the study of glucose tolerance.

Summary

In fifty patients with asymptomatic enlargement of the parotid glands notable features included the history of poor diet, obesity, liver disease, impaired glucose tolerance, and a tendency to hypertension. In these patients, as well as in others described in other countries, parotid enlargement seemed to accompany disturbed nutrition — possibly protein deficiency.

Adapted from *New England Journal of Medicine* **257**:1267 (Dec. 26) 1957.

Allergy Problems in Dentistry

WHEN DENTAL factors in allergy are under consideration, the examiner must regard infected teeth, contact reactions to dentures, and sensitivity to drugs and anesthetics used in dental work as potentially related to such allergic manifestations as urticaria, asthma, migraine, and angioneurotic edema. Conversely, periodontal disease and deformed teeth can result from allergic conditions, notably asthma. The typical allergic facies of asthmatic children frequently includes crooked teeth; nasopharyngeal edema causes nasal obstruction, septal deviation, and poor development of sinuses, eventually leading to constriction of the upper dental arch and inadequate space for growth and eruption of teeth.

From *Modern Medicine* **26**:160 (April 1) 1958.

Treatment of CROWDED LOWER ANTERIOR *Teeth in Adults*

JOHN B. PUCKETT, D.D.S., El Paso, Texas

DIGEST

Little has been published on the subject of irregularly positioned lower anterior teeth, sometimes known as "collapsed" or "buckled" teeth in periodontia, since the reports of Rowe Smith in 1947.[1] Although several methods of treatment are possible, the author of this article prefers for the average adult with this particular orthodontic problem, extraction as the most advantageous measure for correction. Specific directions are given for the procedure adopted as successful and long lasting in a variety of cases, in all age brackets, for a number of years.

Etiologic Factors

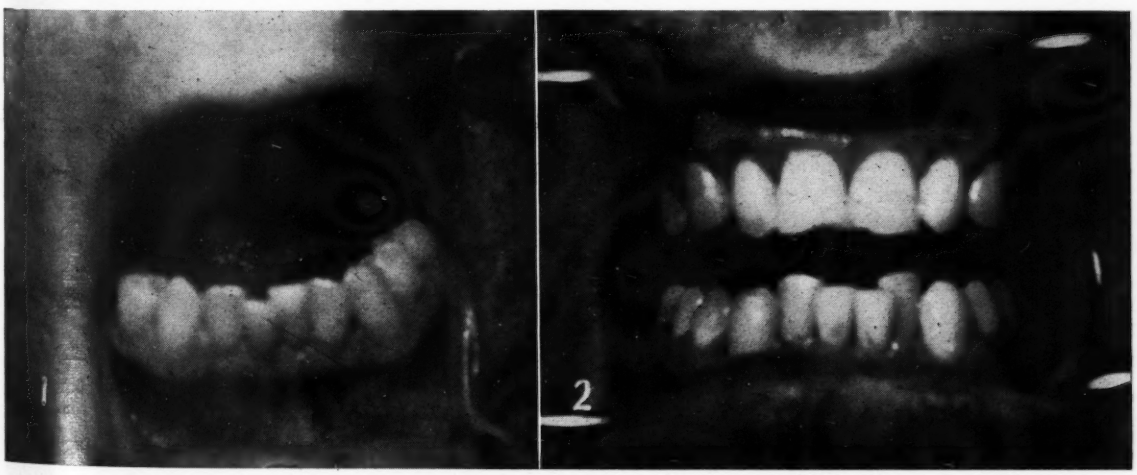
Orthodontists disagree as to the exact causes of anterior crowding: (1) Some practitioners believe it involves vertical dimension,[2] (2) others believe it due to labial muscular action,[3] (3) the cause is described by some authorities as an inward pressure on the lower dental arch from the overlap of the upper dental arch,[4] and (4) the "anterior component of force",[5] is considered by others to be the cause. The condition, whatever its etiology, was created in childhood. Whether the teeth are centrals, laterals, or cuspids, there is an accompanying periodontal complication. The problem resolves into the best method to correct the crowding.

[1]Smith, Rowe: Periodontal Conditions Associated with Buckling of the Lower Anterior Teeth: Etiology, Diagnosis and Treatment, JADA **34**:303-309 (March) 1947.
[2]Strange, Howard E.: Three Dimensional Consideration of Occlusion, Am. J. Orthodontics **26**:788-789 (July) 1940.
[3]Strang, Robert H. W.: Factors of Influence in Producing a Stable Result in the Treatment of Malocclusion, Am. J. Orthodontics **32**:314-316 (June) 1946.
[4]McGonagle, Robert R.: Loss of Teeth as a Danger in Development of Occlusion, JADA **50**:57-64 (Jan.) 1955.
[5]Salzmann, J. A.: Principles of Orthodontia, Philadelphia, J. B. Lippincott Company, 1943.

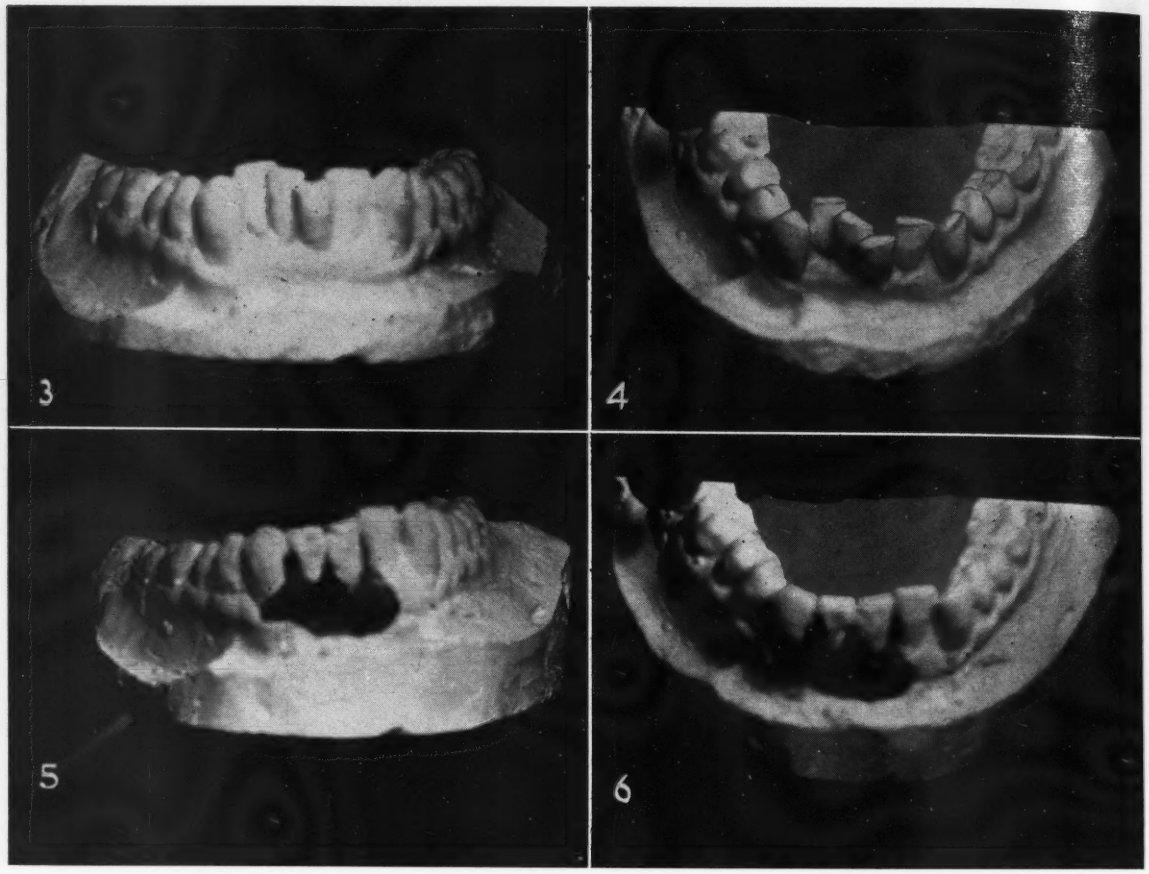
Possible Methods of Treatment

A healthy field for the anterior segment of the lower jaw can be obtained by curettage and operative procedures with the teeth in the position in which they present themselves. If the "buckling" of the teeth is of considerable proportion, however, the patient will find it consistently difficult to brush properly, and repeated surgery will be required to maintain a favorable condition in the crowded area. To obviate the necessity of repeated surgery one tooth of the anterior segment may be removed for a realinement of those remaining.

Orthodontic Treatment—This is the optimum measure and is the one pursued by clinicians in agreement



1. *Typical nonextraction case. The overlap total is much less than the mesiodistal diameter of the narrowest tooth.*
2. *Favorable condition for extraction. The lower central incisor will have a mesiodistal diameter equaling the overlap of the remaining teeth. The result is shown in Figures 10 and 11.*



3. *Use of cast for observation and calculation: labial arch before extraction.*
4. *Use of cast for observation and calculation: incisal arch before extraction.*
5. *Use of cast for observation and calculation: labial arch after extraction, teeth held by carding wax.*
6. *Use of cast for observation and calculation: incisal arch after extraction, teeth held by carding wax.*

with the McGonagle theory of facial development.[4] This procedure certainly should be followed in young teenagers. The majority of periodontal patients, however, who present themselves with extremely crowded anterior teeth are adults whose faces and bones have achieved maturity, and it is with this condition in the adult mouth that this article is concerned.

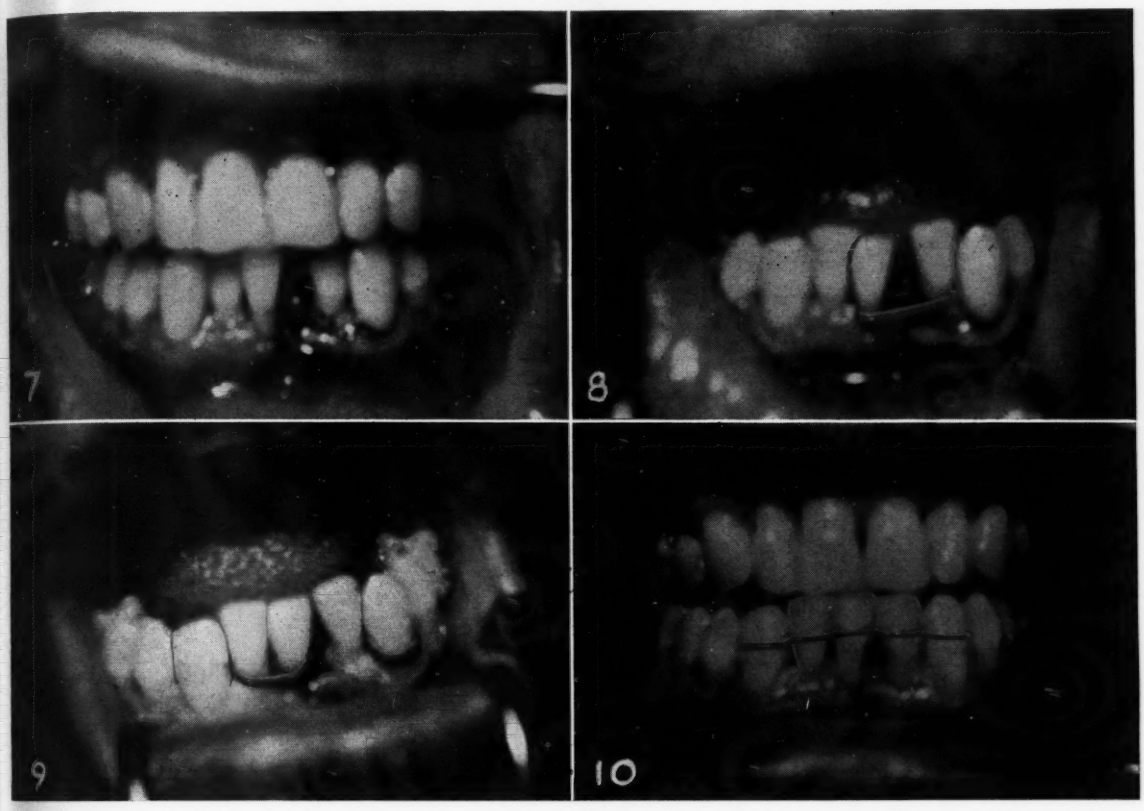
Extraction May be Advisable—The profession has been reminded recently that expansion of the basal dental portion of the mandible by orthodontic appliances is unobtainable and actual jaw enlargement has never been demonstrated.[6] From John Hunter, who first showed that the anterior segment of the mandible ceases to grow after the eruption of the first molar[7] to Schour, et al.[8], the facts seem to corroborate the statement that for the average person with an orthodontic problem of the crowded anterior type, extraction is the most advantageous procedure.

Choice of Tooth to be Removed

In a crowded anterior segment, there is usually one tooth that has a greater pathologic involvement than the others. Under ordinary circumstances, this is the one that has been moved out of alinement and is the tooth that is selected for extraction. Shapiro[9] states that movement of the tooth benefits a periodontal condition and that the affected tooth responds more quickly than a tooth that is not given orthodontic attention. He further observes that pocket depths and original mobility of the tooth apparently do not adversely affect the results.

Factors to be Considered—According to Glickman,[10] "Satisfactory prognosis exists when overbite is slight and the residual space after extraction is small." However, esthetics and the facility with which the space can be closed must be considered (Figs. 1 and 2). These factors are of prime

[6]Herzberg, B. L.: Extractions in Orthodontics and the General Practitioner, Illinois D. J. **23**:781-792 (Dec.) 1954.
[7]Weinberger, B. S.: Orthodontics: A Historical Review of its Origin and Evolution, St. Louis, C. V. Mosby Company, 1926, Vol. 1, p. 160.
[8]Schour, I.; Hoffman, M. M.; Sarnat, B. G.; and Engel, M. B.: Vital Staining of Growing Bones and Teeth with Alizarin Red, J. D. Res. **20**:411-418 (Oct.) 1941.
[9]Shapiro, Max: Orthodontic Procedures in the Care of Periodontal Patient, J. Periodontol. **27**:7-15 (Jan.) 1956.
[10]Glickman, Irving: Clinical Periodontology, Philadelphia, W. B. Saunders Company, 1953, p. 934.



7. *Procedure in mouth: the case shown in Figure 2, the tooth chosen and extracted.*
8. *Procedure in mouth: rubber ligation, initial movement.*
9. *Procedure in mouth: rubber ligation, second movement.*
10. *Procedure in mouth: teeth in position, wire ligation.*

importance and one cannot be considered more important than the others.

Main Problem—From the operator's viewpoint, the closure of the arch presents the main problem. There must be sufficient tooth material available in the form of the overlaps of the remaining teeth to fill the gap created by the loss of the tooth selected for removal.

Use of Study Models—For the inexperienced operator study models can readily be made, and from them accurate measurements taken and the design of procedure evolved (Figs. 3, 4, 5, and 6).

Measurements Made in Mouth—The experienced operator may make directly in the mouth a careful comparison of the overlaps to the mesiodistal width of the tooth to be extracted. Frequently the tooth chosen for extraction will have a mesiodistal diameter too great for the sum of the overlaps of the remaining teeth and a moderate overlap in the result must be anticipated. Equally often, the diameter of the selected tooth is such that the alinement can be accomplished over a smooth, even arch. On rare occasion, as a compromise between esthetics and brushing functions, the mesiodistal diameter of the selected tooth will be smaller than the sum of the overlaps and a slight diastema must be expected.

Procedure

The selected tooth is extracted at the time of regular periodontal attention, and immediately a small orthodontic rubber band, such as that included in S.S. White Assortment 240Y, is applied to the two incisors proximal to the socket. Approximating movement is thus begun. A resumé of methods can be found in an article by Hirschfeld and Jay.[11] Figures 7, 8, and 9 illustrate this method.

Approximation Attained—Usually efficiency of the elastic will be lost in three days, and a new band should be substituted. The gap gradually will close, and conjunction of the contact points will take place over the old socket (Fig. 10). The following steps may be taken:

(1) When the two teeth approximate, they are ligated together with wire.

(2) If further movement of the other incisors is indicated for harmony of the bite or for appearance, the other tooth or teeth are maneuvered in the same manner until the desired results are obtained.

(3) The line of incisors is ligated with wire for a period of three

[11] Hirschfeld, L., and Jay, J.: Minor Tooth Movement by Means of Rubber Dam Elastic, JADA **50**:282-300 (March) 1955.

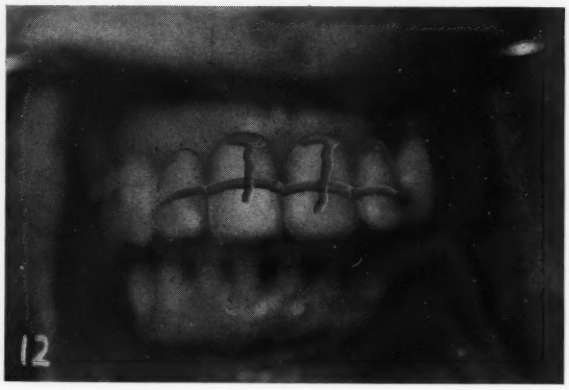
months, during which time sufficient bone is normally deposited to create stability of the tooth.

(4) At the end of the three-month-period the ligatures are removed, the incisal spot-grinding and equilibrating are done, and the procedure completed is satisfactory both esthetically and physiologically (Fig. 11).

Tissue Trauma Avoided—Concern over trauma to the gingival tissues is needless: (1) The individual elastic is not in place for more than three days at a time. (2) It can be readily removed by the patient if it becomes uncomfortable. (3) It is superior to the grassline method of movement; and if double-looped wiring is employed (Fig. 12), the ligature will be retained by the twist of the vertical wire without impingement on the soft tissues.

Occurrence of Osteoblastic Action—As in regular orthodontic procedures, osteoblastic action has taken place in the mesial wall of the socket of the moving tooth. When the tooth has ceased its movement, osteoblastic fill-in has occurred distally and has built and strengthened new mesial wall.

11. ***Procedure in mouth: postoperative result.***



12. ***Wire ligation for special movement (double loop).***

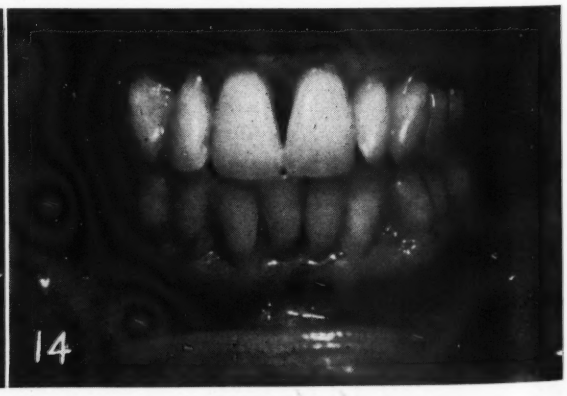
Discussion

The criticism might be made that the method presented has merely tipped the crowns to fill the space and has not moved the roots to bring the teeth into vertical relationships. This is often true whether treatment is accomplished by orthodontic banding and arch-wire appliances or by rubber ligatures alone. A general survey of clinical pictures and x-rays gives the impression that if the teeth moved were originally vertically placed, they completed their movement vertically placed. If they were tilted originally, they completed their movement at an angle. Vertical movement and rotation of the root can frequently be achieved if the tooth to be moved is double-looped with a wire passing just above the cingulum, then below it, and another loop is made in the incisal third and the twisted wires are joined vertically using the ends as a hook. Tipping action itself, however, has returned the tooth to a position in more correct relation to the basal portion of the mandible.[12]

Balance Maintained—The objection may be made that normal occlusion is not achieved by a crown-tipping process, but that every malocclu-

[12]Op. cit.: p. 286.

13. ***Preextraction, lower left cuspid.***



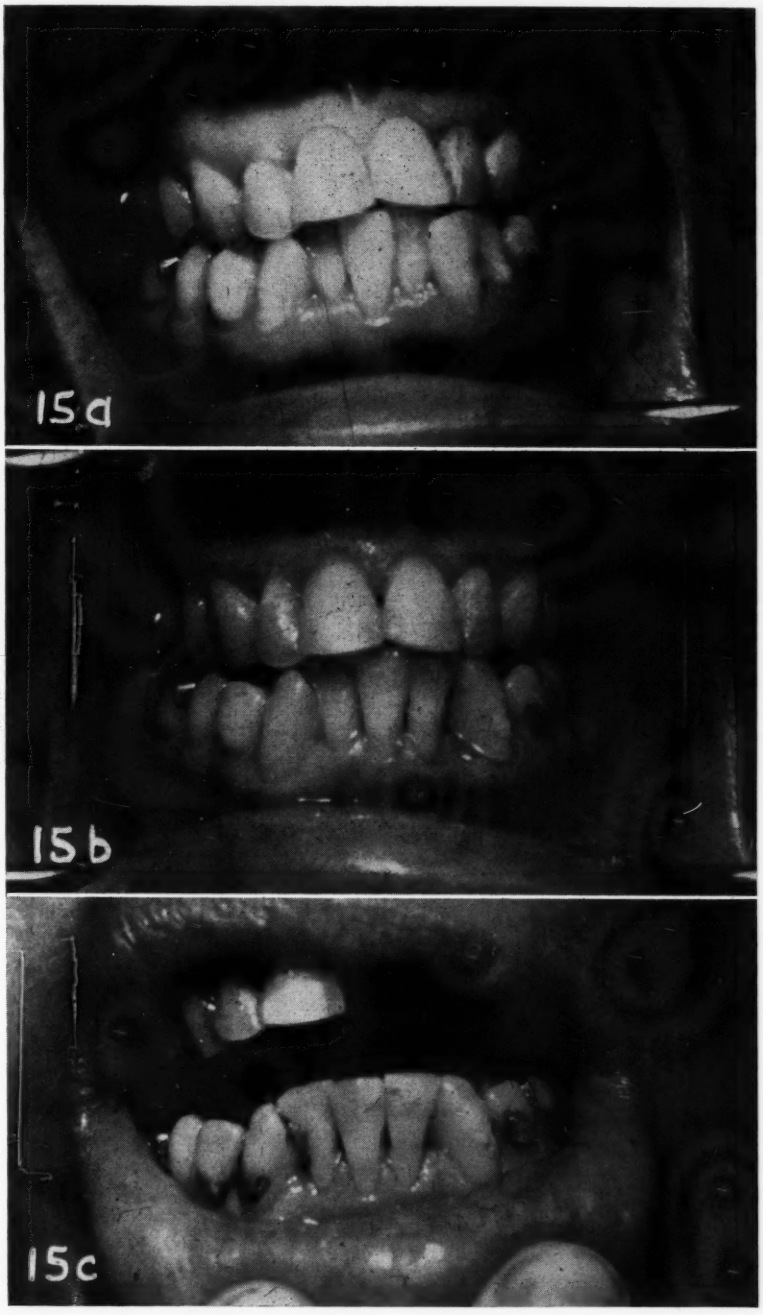
14. ***Postoperative view, lower left cuspid.***

sion represents a denture in balance with all its associated structures.[13] The loss of a crowded incisor tooth has a tendency to improve lateral movement without interfering with vertical dimension. The method therefore maintains the required balance. It matters comparatively little whether the incisal arc is modified and improved into a smooth elipse by means of vertical root movement or by modified tipping, plus spot-grinding of the incisal third.

Advantages of Method.—Originally, the teeth moved were tipped to some degree, and tipping in the same or another direction that improves the incisal arc and the labial arch is more to be desired than the original crowding of the anterior segment. It aids in unlocking lateral excursions and permits improvement in brushing techniques.

Additional Use—Although Smith[14] warned that this method should be used only with incisors, it has been employed to eliminate a badly offset cuspid for the purpose of unlocking lateral movement and for esthetic reasons. There seems to be no valid justification for the warning against its use in such a place.

Results are Lasting—Smith shows a case sixteen years after treatment. Views of a patient seven years after therapy are shown in Figures 15a, 15b, and 15c. Forty-seven male patients and forty-two women have been treated by the author in the manner described during the past three years. Of this total of eighty-nine patients, nineteen were in the age bracket of 21 to 30 years; twenty-seven were ages 31 to 40; thirty-one were 41 to 50; and twelve were 51 and older.



15a *Postoperative view of mouth, September 1949.*
15b *Postoperative view of mouth, March, 1949.*
15c *View obtained in March, 1957*

Recapitulation

1. The inciting causes of crowded anterior teeth were created in childhood.

2. The removal of a crowded tooth rapidly improves esthetics and efficiency of the lower anterior teeth.

3. Movement of teeth benefits periodontal conditions.

4. Elastic ligatures accelerate mesial drift for alinement of the remaining teeth.

5. Time required for treatment is comparatively short.

6. Brushing efficiency is greatly enhanced by the correction of the curvature of the labial arch.

7. Efficiency of the lateral thrust of the mandible is never impaired.

8. Results are almost invariably pleasing to the patient as well as satisfactory to the operator.

1501 *Arizona Street*

[13]Strang, Robert H. W.: Factors of Influence in Producing a Stable Result in the Treatment of Malocclusion, Am. J. Orthodontics **32**:327 (June) 1946.

[14]Smith, Rowe: Periodontal Conditions Associated with Buckling of the Lower Anterior Teeth: Etiology, Diagnosis and Treatment, JADA **34**:305 (March) 1947.

Investigation of Neuropathologic Manifestations of Oral Tissue: INHERITANCE *and* EMOTION *as Related to Tooth Structure Breakdown*—Part Two

NEWTON W. MELLARS, D.D.S.,
and FREDERICK W. HERMS, D.D.S., San Francisco

DIGEST

In this installment, which is the second in a series of four, the authors discuss specifically the composition of enamel rods in tooth structure, including the results obtained from examination under polarized light.

Composition of Enamel Rods

The polarizing microscope shows normally strong enamel rods to appear as clean-cut structures having no break along or within their formations. An interesting phenomenon of the enamel rod is the manner of its structural composition wherein rather equally distant interruptions occur along the length of an enamel rod which seems to indicate that the rods are composed of finer singular crystalline components. An early observation of the authors, later supported by Helmcke, was that the enamel rod was composed of finer elements.

Singular Crystal Figures Difficult to Resolve—It is difficult to obtain an adequate interference figure of the enamel crystals resolvable under the light microscope employing crossed polars or wedge components. Neither with the back lens of the objective nor with aid of the Amici-Bertrand lens has it been possible to resolve singular crystal biaxial or uniaxial figures with any degree of clarity.

Possible Presence of Uniaxial Crystal Arrangement—There are some indications that zero isogyres may show a uniaxial crystal arrangement. (Helmcke has effectively determined the type of crystal) in enamel as uniaxial by analysis of x-ray diffraction pattern. (This result became known to us after completion of study with the polarizing microscope.)

Method of Study—Sections of teeth reduced to a thickness of between .001 and .003 inches were ground, polished, and mounted on a cover slip, in neutral balsam. Sections were not stained. The teeth freshly extracted and sectioned were placed under crossed polars using 450 to 800 X magnifications and strain-free objectives, and demonstrated enamel prisms arranged in periodic structure.

Diffraction Spectra Revealed — By this method, when the substage condenser diaphragm is closed to give a narrow axial beam of light, diffraction spectra of the first and second order are revealed at the back lens of the objective. Dentine also appears as a periodic structure (probably due to dentinal tubules) but the diffraction spectra are not as pronounced as with enamel.

Pulp Stone Structure—This is not periodic and diffraction spectra at the back lens are not visible. Weak birefringent characteristics, however, are important and classifiable in pulp stone structure variations as determined with aid of the Berek compensator.

Ectodermal and Mesendermal Structures—It is safe to assume that enamel, dentine, and pulp stones are different in their chemical or crystalline structural characteristics. This is as it should be when comparing the origins of these structures, that is, enamel is ectodermal and other connective tissue structures are mesendermal.

Average Results in Refraction Tests —Comparisons of indexes of refraction tests employing the polarizing microscope with white light as an illuminator and the Becke method, reveal interesting average results in enamel, dentine, bone, and also pulp stones:

1. The tests of enamel proved to be consistently the same and were 1.5928. This was true in all ages and degrees of health in the patients of both sexes examined.

2. Dentine varied from 1.5552 in patients in subnormal health to 1.5636 in patients in robust health.

3. Alveolar bone in patients in poor health averaged 1.5456, in contrast to patients in good health averaging 1.6210. One patient in excellent health, male, 80 years of age, showed a refractive index of 1.6226.

4. Pulp stones averaged 1.5483. The lack of fluctuation was true of ectodermal enamel and not true of connective tissue elements which showed variations.

Basic Apatite Formation — Both Orban and Helmcke agree that the submiscroscopic crystals of enamel belong to the hexagonal system and are basically an apatite formation.

Helmcke determines the enamel crystal to be a monocrystal of hydroxylapatite with the formula $3Ca_3(PO_4)\ Ca\ (OH_2)$. His determinations were made by x-ray diffraction.

Results of Examination Under Polarized Light

Potentially weak enamel presents a totally different picture from the nor-

mal when observed under the polarized light at 450 X and lower magnifications.

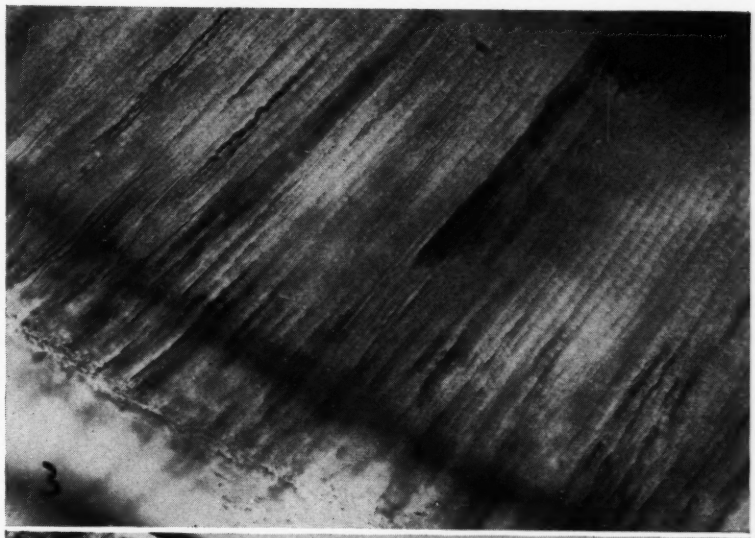
(1) When the polarizer is vibrating north and south and the analyzed is turned 30° from the crossed position at 450 X, a series of classifiable imperfection patterns are best observed.

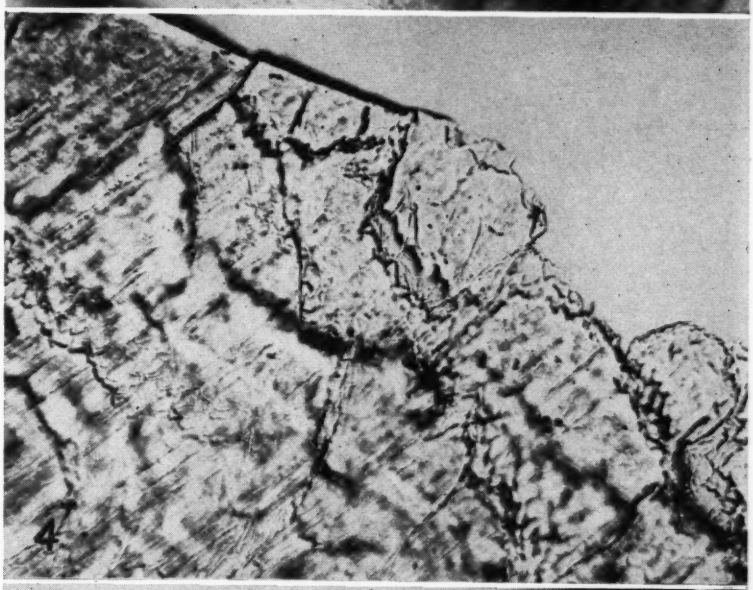
(2) Many appear reddish brown in color under the polarization and vary in area diameters. The thickness of such sections is .003 inches.

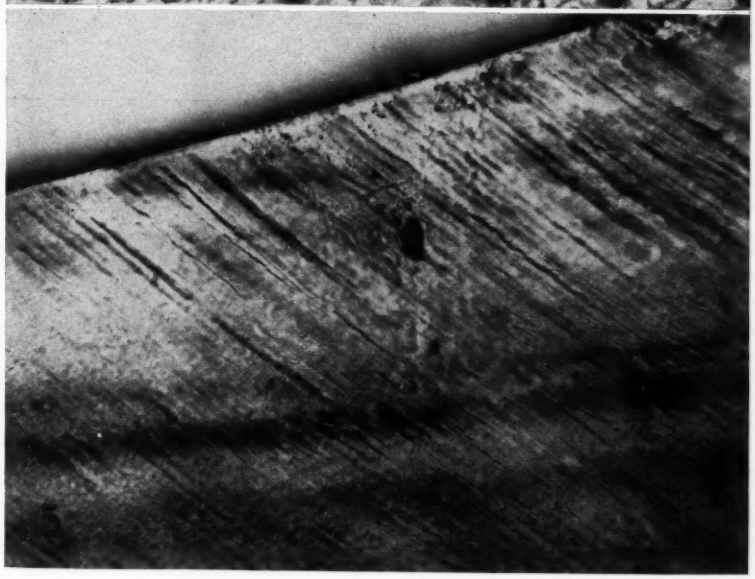
(3) An extremely low index of refraction has been observed among bone alveolar structures of alcoholics and it is noted that, generally bone inorganic salt metabolism bears a relationship to the index of refraction. This probably explains why many denture patients present a greater or lesser degree of resorption in their alveolar ridges. This is also true of periodontic cases.

Dental Cases Observed—In Figure 2 the rising bars indicate the number of cases per hundred of patients examined, where the occurrence of different dental pathologic changes was observed. Most of these cases are taken from personal practice, although some are hospitalized patients at the Napa State Hospital at Imola, California, a psychiatric institution.

Inheritance Characteristics Illustrated—In Figures 3 to 10 are shown classifiable inheritance characteristics found in enamel. It should be emphasized that in many instances these patterns are not surface characteristics but lie deep below the outer







3. ***Appearance of abnormally thickened lines extending from outer enamel surface toward dentine. Thicker lines seem to be longitudinal spaces or pseudo-cracks lying parallel to the axis of the enamel rods.***

4. ***Beneath the surface appear irregular lines or pseudo-cracks along with and across the enamel rods going in various directions. Some seem to separate the enamel rods along their continuities. The outer surface of the enamel is rough and uneven.***

5. ***Tiny lake-like spaces appear under the enamel surface lying at various depths. They are different in size, some being quite large.***

enamel surfaces and in close proximity to the dentoenamel junction. Such flaws or imperfections lie in wait and are susceptible to attack if outer forces are sufficiently strong to break or fragment imperfect enamel rods which exist in, and adjacent to, the weakened imperfect areas.

Deeper Areas Exposed — When enamel is worn away through abrasion or is traumatized, as with usual chewing, deeper areas are exposed and enamel cavitation follows.

Areas Exposed to Fragmentation

It has been assumed that the interproximal enamel contact areas of the tooth crown, in many respects less exposed to trauma during chewing, probably had greater protection and therefore would show less tendency toward cavitation. Extensive study, however, has demonstrated that interproximal areas, and especially the contact points, harbor more saliva and debris as the result of capillary attraction than do the more exposed enamel areas.

Hard Foods Act as Cutting Agents —Microscopic examinations of many usual foods, especially vegetable, show considerable amounts of minute, hard grit materials in the form

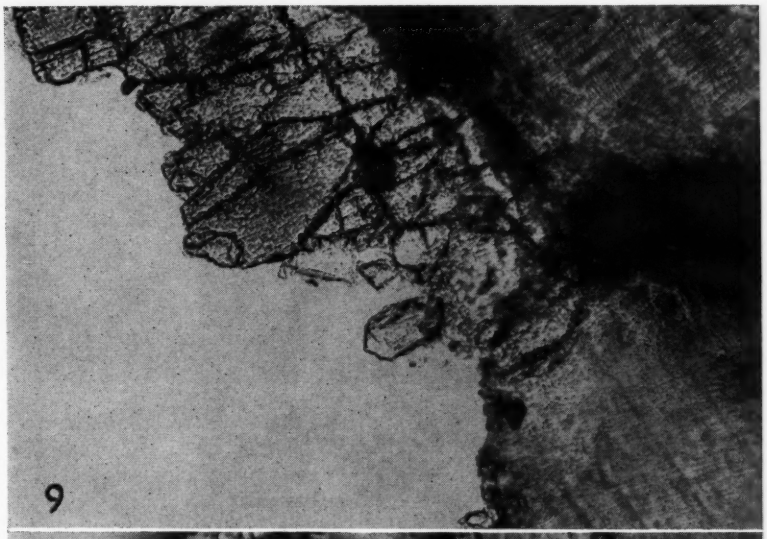
6. ***Cloud-like formations of flaws or psuedo-cracks running in a scalloped pattern at varying angles to the enamel rods are found at different levels below the enamel surface. Many are seen near the dento-enamel junction.***

7. ***Small grape-like clusters composed of minute empty cells. The openings formed are intercommunicative, similar to a sponge. They appear in many areas and are commonly found to abound along, and become a part of, the more severe types of enamel cavitations. Portions of the clusters may open to the outer enamel surface and other clusters exist by themselves, lying deep within the enamel close to the dento-enamel junction with no opening to the enamel exterior.***

8. ***Pencil cracks or pseudo-cracks extending in a thin line formation from the outer enamel surface to the dento-enamel junction. This type does not often break down but when it does, it forms a tiny, round pit and penetrates quite deeply.***

9. ***Heavy cracks in and across the enamel resulting in large and small seemingly cleaved enamel segments. Cracked-off segments are seen as separating from the main body of the enamel, giving rise to cavitation. (This photomicrograph was taken as a cross section of an enamel cavitation of average depth; the lower part illustrates the deepest part of the cavity.) Other fragments are seen to separate at the bottom of the cavitation and are of varying sizes and shapes.***

10. ***Extremely coarse cracks at the incisal edges of upper incisor teeth.***



of hard siiicious substances. Some of these crystals are sharp. As teeth move against each other at the contact points during opposing cuspal adjustments while masticating, these hard materials appear to act as cutting agents. Abrading agents cause the weak enamel rods to fragment and cavitation subsequently occurs.

Penetration by Therapeutic Substance not Demonstrated — We feel that thus far evidence has not been found to support the assumption that chemotherapeutic substances can be deposited among weakened enamel rods in order to occlude, fill, or preserve enamel against further fragmentation.

(*End of Second Installment*)

1607 *McAllister Street*

Author's Note: *Credit is given to George Needham, M.A., University of Washington, microscopist and research chemist, for cooperating with the authors in this research in refractive index material.*

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How to Show Slides for PATIENT EDUCATION

WALTER M. DROZDIAK, B.S., D.D.S., San Jose, California

DIGEST

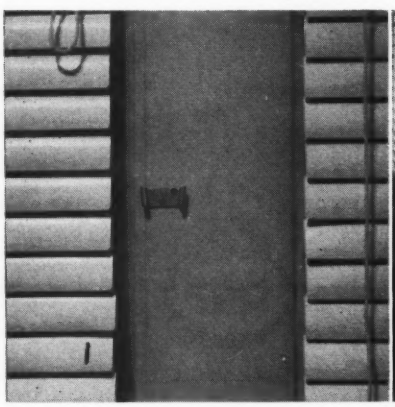
The use of color slides as a means of demonstrating dental procedure is far more effective when the slides are projected onto a screen than when viewers of one kind or another are used. Projection must be simple and easy to use, however, or the slides will not be shown as often as they should. The useful and efficient procedure presented here will ensure routine use of the slides.

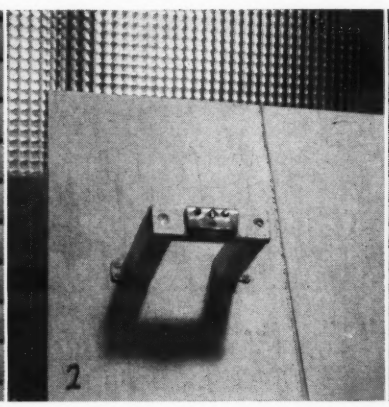
Equipment

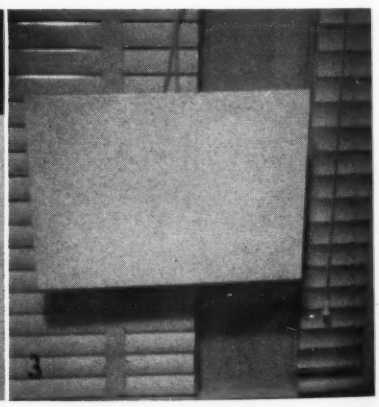
Procure a blower-type slide projector small enough to be carted on a wheeled, shelved table for portable use in several rooms. A small 12-inch by 24-inch screen made of ¼-inch plywood painted with dull flat white paint is carried on one of the shelves. The back of the screen is fitted with an adapter so that it can slide into the complementary holder attached to the wall at each position where the slides are to be projected. The slides are kept mounted and labeled in the magazines, ready for insertion into the automatic slide changer.

Method for Color Pictures—A reflex camera is used to take color pictures of cases completed in the office, as suggested by Cathcart.[1] Another method using miniature flash bulbs (M2) with a Focalite reflector and reflex camera has been described by Gilbert.[2] With this reflector and auxiliary lenses on the camera at a focus-

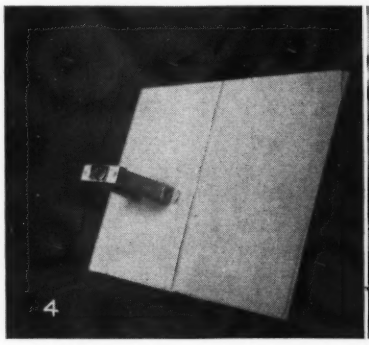
[1]Cathcart, Jack F.: Dental Photography, DENTAL DIGEST **56**:20 (January) 1950.
[2]Gilbert, Bert W.: A Simplified Method of Clinical Photography, JADA **51**:552-555 (November) 1955.







1. *The female mounting bracket fastened to the wall at the point where the screen is to be mounted.*
2. *The extension struts and male supporting bracket mounted on reverse side of the screen.*
3. *The screen mounted as it appears to the patient in the chair.*
4. *Overall rear view of screen.*
5. *View from above the screen showing mounting detail.*



ing distance of four inches, a correction filter No. 82-A is used with exposure of 1/125 second at f22, using Kodachrome type F film and clear M2 flash bulbs. Bright sunlight and other artificial light should be excluded.

Bracket can be Fabricated—A wall bracket of the type used to hold removable wall-type can openers is used to hold the screen (Fig. 1). This can be procured at any hardware store. The opposing, or male, bracket (normally part of the appliance) which slides into the wall-mounted bracket, may be more difficult to obtain and may have to be fabricated from available materials.

Clearance Provided—Wooden struts are fastened to the back of the screen to provide clearance for window sills and blinds. To this extension is fastened the male bracket made from 1/8-inch metal cut to fit the female mounting bracket. It is off-set with screws and washers to permit sliding into the wall unit and thus supporting the screen (Fig. 2).

Figure 3 shows how the mounted screen appears to the patient in the chair.

Procedure

The following steps are taken:

1. The projector and screen are kept on the mobile table in the operating room.

2. When the pictures are to be shown, the table is wheeled into position so that the slides will be projected onto the screen in front of the patient as he sits in the dental chair.

3. The screen is slipped into its holder on the wall directly in front of the patient.

4. The projector cover is removed, the cord is plugged into an outlet socket, and the room darkened slightly.

5. Appropriate slides are projected onto the screen by the assistant while the dentist explains the condition under consideration. The assistant might do this alone, when the dentist is elsewhere.

6. Upon completion of the showing, the table is moved aside, the screen removed, and the projector secured to await future showings.

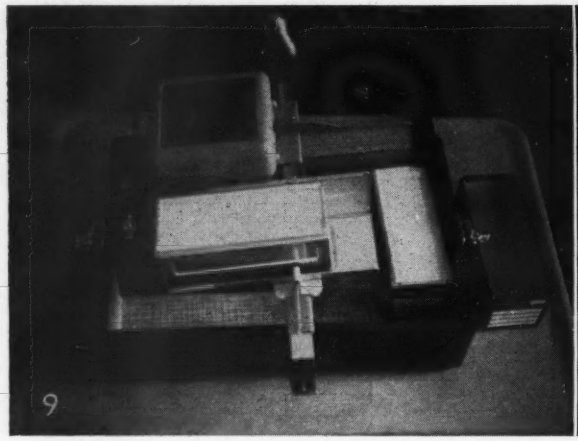
6. *Camera and Focalite reflector assembly.*

7. *Camera in use.*

8. *Projector standing ready on table. Shelves provide convenience for screen and lid.*

Subject Matter

The series of color slides, *Visual Education in Dentistry*, made available by DENTAL DIGEST, are ideal for showing. They are available with lecture material describing each condition. All of the slides may be shown a particularly interested patient or only one or two which will explain the specific condition in which the patient is interested. Pictures of cases actually treated in the office showing "before", "during", and "after" con-



9. *Projector with slide magazine in automatic slide changer.* **10.** *Projector in use.*

ditions will stimulate in the patient an interest in the possibilities of similar treatment for himself. It is important to point out that the slides shown were made of treatment completed in the office.

Summary

If color slides are to be used as a feature of dental health education material in the dental office, the apparatus for showing them must be easy to use. The procedures outlined will create a definite interest on the part of patients and will often encourage them to undertake treatment which they might otherwise neglect.

260 *Vine Street*

An Evaluation of High Speed Rotary Cutting of Tooth Tissue

H. H. PEARSON, D.D.S.

Advantages of Intermediate and Ultra High Speed Rotary Cutting

(a) As the speed increases a greater amount of tooth tissue may be removed in less time. The removal of metal restorations and the cutting of enamel becomes simple.

(b) Because smaller diamonds and burs cut with greater speed and more precision at these speeds, all surfaces of posterior teeth may be reached without traumatizing the soft tissues and adjacent teeth, as frequently occurs when larger stones and discs are used.

(c) In ultra high speed, vibration has been removed by the elimination of gears and the substitution of rubber or plastic chucks for the metal chucks and latches. Noise has been transferred from the bur head to the pulley end of the handpiece making it more tolerable.

(d) The required pressure has been reduced from over two pounds to less than ½ ounce.

(e) The heating up of the handpiece and the entrance of debris and coolant around the bur shaft has been eliminated by a forced air system into and through the mechanism.

(f) Thermal control system is built into the handpiece so that the coolant may be directed exactly at the point of cutting on the tooth and bur.

(g) Sufficient torque is necessary to support the cutting ability of the bur or diamond, on curved or angular surfaces and on hard substances such as enamel, gold, or amalgam. Without torque, burs and diamonds tend to skid off these surfaces.

(h) The syndrome of patient reaction to rotary tooth cutting at the lower and intermediate speeds up to 50,000 r.p.m. is made up of psychologic and neurologic pain. The use of ultra high speeds, plus coolant, removes the neurologic pain by eliminating the vibration, heat, and pressure, and reducing the operating time, thus altering the threshold of neurologic pain in most patients to a point of tolerance.

Disadvantages of Intermediate and Ultra High Speeds

(a) These cannot be used safely for the removal of caries, for prophylaxis, for occlusal adjustments, or for polishing and burnishing metallic restorations.

(b) Visibility is reduced by the spray of the coolant, making the refinement of the preparations such as bevels and line angles difficult.

(c) Cutting instruments of over 3 millimeters in diameter cannot be used with safety, since the centrifugal force at the periphery of the larger instruments will throw off the coolant, preventing it from reaching the tooth surface, thus producing thermal shock or destruction of the pulp.

(d) Digital dexterity and tactile perception must be retrained and perfected to accommodate a more perfect control of the reduced pressure required.

(e) Steel burs are worthless at these speeds.

(f) Carbides wear out faster than hitherto.

(g) Diamonds break down more rapidly, due to the failure of the bonding medium to retain the diamond abrasives at these speeds.

From *Journal of the Canadian Dental Association* **24**:141 (March) 1958.

The EDITOR'S Page

THE SCIENTISTS who have questioned the biology of fluoridation have directed their objections to the possible systemic hazards that may follow the ingestion of fluoridated water over long periods of time. There have been only a few studies made of this subject by physicians. (They are the only ones that are competent to evaluate the evidence.) These studies have been conflicting. Some of the observers are of the impression that they have encountered a syndrome that is directly associated with the drinking of water that contains fluoride. Other clinicians disagree. From the facts at hand the evidence is inconclusive.

Another, and valid approach, to the subject is to examine necropsy protocols to determine if there are any significant postmortem findings among persons who have drunk fluoridated water during any part of their lifetime. Such a study has been made and should be given consideration[1].

Geever, et al. have reported on a series of 904 necropsies performed in Colorado Springs, Colorado where the *natural* fluoride level of the drinking water is 2.5 parts per million. The senior author reviewed the protocols and classified them according to:

"1) The major cause of death; 2) contributing causes unrelated to the major cause; 3) incidental pathologic condition."

There was nothing uncovered in this study that would suggest a relationship between the ingestion of naturally fluoridated water and systemic disease. If it is presumed that water that is fluoridated through the processes of nature and that which is fluoridated by the voluntary act of man represents the same biochemical behavior, the deduction can be made that nothing was revealed at necropsy that would indicate an increase in the incidence of mortal disease.

Not all scientists are agreed, however, that natural and artificial fluoridated water are the same. Dillon[2] has suggested that water that bears fluorine salts that has passed through the earth and through the bodies of living things over a projectory of time has already made an attachment with calcium that makes such water safer for consumption than water that is artificially fluoridated.

Many chemists do not agree with this view that has been expressed by Dillon. They assert that the fluoride ion "is the same" under either condition of origin. The subject must be further examined and debated by biochemists, who have different views and values from inorganic chemists.

No one should deny that the examination of tissue after death reveals important clues to morbidity and mortality. Dead tissue, however, is not the same as living tissue. Within living tissue dynamic reactions and interchanges are constantly at work. Many of these vital reactions cannot be measured or studied by the methods that are now known to science. Perhaps this is what Alexis Carrel meant when he wrote[3]:

"In fact the chemical elements of the outer world act on each individual in different ways, according to the specific constitution of his intestinal mucosa. From these elements are built our tissues and our humors. Man is literally made from the dust of the earth. For this reason his physiological and mental activities are profoundly influenced by the geological constitution of the country where he lives, by the nature of the animals and plants on which he generally feeds. His structure and his function depend also on the selection he makes of certain elements among the vegetable and animal foods at his disposal . . . Our aptitudes and our destiny come, in some measure, from the nature of the chemical substances that construct our tissues. It seems as though human beings, like animals, could be artificially given certain bodily and mental characteristics if subjected from childhood to appropriate diets."

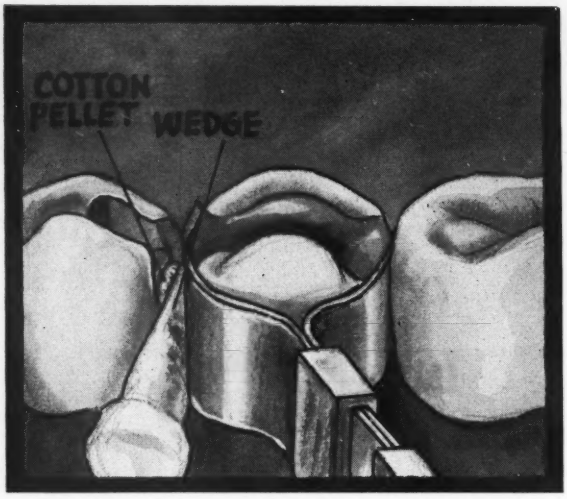
The report of the necropsy material is important and certainly suggests that by the methods used in the examination of this material nothing was revealed that would suggest that drinking naturally fluoridated water was a direct or indirect cause of death of the subjects in this series of cases.

[1]Geever, E. F., et al.: Pathologic Studies in Man After Prolonged Ingestion of Fluoride in Drinking Water. 1. Necropsy Findings in a Community with a Water Level of 2.5 ppm, JADA **56**:506 (April) 1958.

[2]Dillon, Charles: The Biochemistry of Fluorides, DENTAL DIGEST **59**:486 (November) 1958.

[3]Carrel, Alexis: Man, The Unknown, New York, Harper & Brothers, 1935, p. 87.

Clinical and Laborato

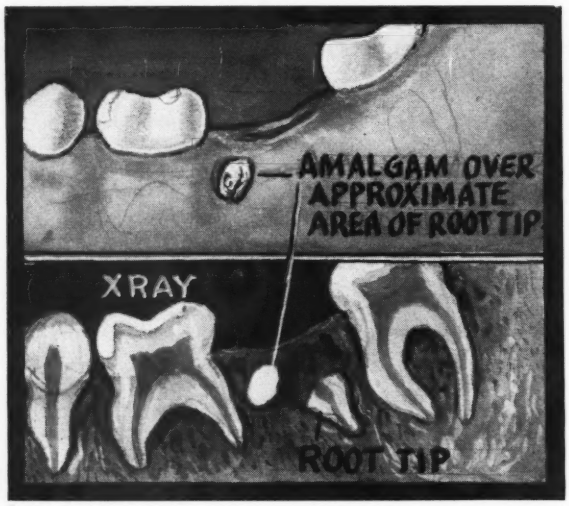


1

Approximating Amalgams

John J. Zazzaro, D.M.D., National City, California

1. When approximating restorations are being made in amalgam a cotton pellet is tightly packed into the cavity that is not enclosed in the matrix. The cotton prevents the matrix band from expanding into the cavity and thus reduces the amount of excess amalgam.

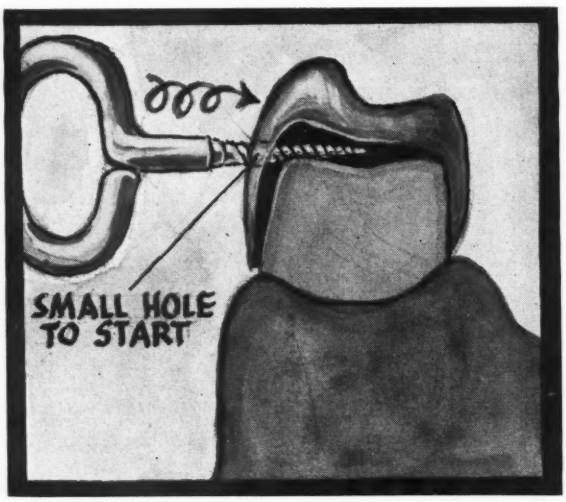


2

Location of an Embedded Root-tip

Claude A. Crabb, D.D.S., Belleville, Kansas

2. After exposing the bone in the general area of the root-tip place a small piece of amalgam over the area and take an x-ray. The small piece of metal is not dislodged by the film and gives an accurate landmark to follow in the exploration for the root fragment.



3

Removal of a Crown

V. Berthod, D.D.S., Vevey, Switzerland

3. Drill a small hole (slightly smaller than the diameter of the screw) into the buccal aspect of the crown, 7 millimeters below the occlusal surface. Insert the screw and twist to remove the crown.

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SUGGESTIONS . . .

Sharpening a Hand Instrument

Leopold Hirsch, D.D.S., New York

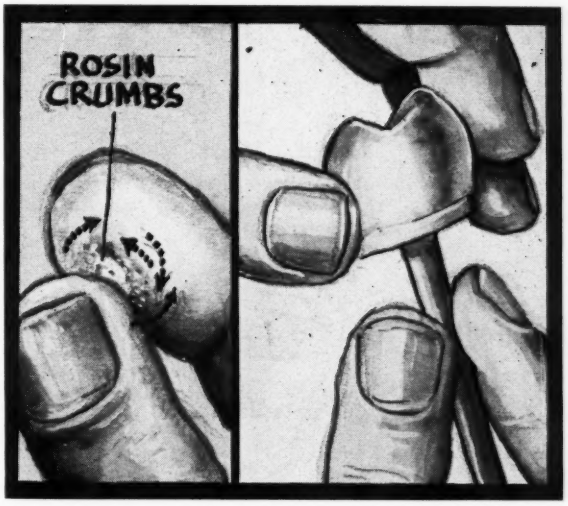
4. Fasten the hand instrument in a face-bow to hold the instrument rigid while sharpening.

4

Removing a Crown Pattern from a Die

John B. Klein, D.D.S., New York

5. Powdered rosin on the fingers permits easy removal of the wax pattern from the die.

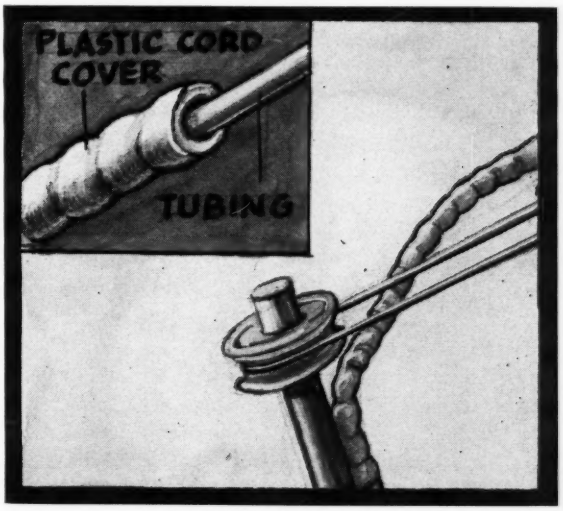


5

Protection of Air and Water Tubings

David Lesser, D.D.S., Brooklyn, New York

6. To protect exposed tubings, used in the various cooling devices, from being ensnarled and torn against pulleys and belts, encase the tubing in spiral type plastic electric cord covers.



6

technique involved; and jot down the advantages of the technique. This shouldn't take ten minutes of your time. Turn to page 322 for a convenient form to use.

Send your ideas to Clinical and Laboratory Suggestions Editor, DENTAL DIGEST, 708 Church Street, Evanston, Illinois.

MEDICINE and the Biologic Sciences

Peptic Ulcer

The treatment of patients with peptic ulcer usually includes three phases: relief of pain and healing of the ulcer during the acute stage, prevention of recurrent episodes, and prevention and treatment of complications. A long-range medical program is required. Failure to observe such a regimen is responsible for most therapeutic disappointments.

The medical regimen for peptic ulcer is based on the theory that gastric hydrochloric acid should be neutralized, secretion inhibited or eliminated, and the motor activity of the stomach and duodenum reduced. Resistance of the mucosa to the acid-pepsin factor should be increased. Management includes a restricted diet, antacids, antisecretory and motor-inhibitory drugs, abstinence from smoking and stimulants such as alcohol and caffeine-containing beverages, and physical and mental rest.

The diet for the ulcer patient must be nutritionally adequate and consist of soft foods taken in frequent small feedings. Foods adsorbing or chemically combining with hydrochloric acid are included in the diet, while foods acting as mechanical, chemical, or thermal irritants are excluded. The daily intake of protein is at least 90 to 95 grams, obtained from milk, eggs, cheese, casein, and milk powder. Vitamin supplements are particularly important to patients who remain on restricted diets for prolonged periods.

Antacid therapy is recommended since milk and cream alone often do not neutralize the gastric hypersecretion. The antacid should not produce acid rebound, systemic alkalosis, or renal changes. Abstinence from secretory stimulants increases the response to antacids and decreases the incidence of exacerbations.

The depressant action of sedatives on the cerebral cortex promotes general relaxation and often facilitates cooperation of the patient. Attention to emotional problems is an integral part of the regimen.

Differentiation between benign and malignant gastric ulcers may be difficult. Reliance must be placed on a careful history and repeated roentgenographic studies. Gastric resection is performed if, after three to four weeks of careful observation, symptoms recur, occult blood is found in the stools, or the ulcer is not substantially reduced in size.

The chief causes of ulcer recurrence are withdrawal of restrictions in the ulcer regimen shortly after symptoms subside, goss dietary indiscretions during periods of convalescence and remissions, fatigue, emotional strain and psychosomatic disturbances, excessive use of tobacco, alcohol, and caffeine-containing beverages, and upper respiratory and other acute infections. An adequate diet should be prescribed for at least six months and spiced foods excluded indefinitely. Alcohol, tobacco, and caffeine beverages are similarly interdicted. During periods of unavoidable stress and tension, a strict regimen is resumed. Prompt and persistent treatment is imposed if ulcer symptoms recur. Antipyretic drugs are employed judiciously and supplemented with antacids.

Sandweiss, David J., and Brooks, Frank P.: Recent Advances in the Medical Treatment of Peptic Ulcer, M. Clin. North America **40**:353-369 (*March*) 1956.

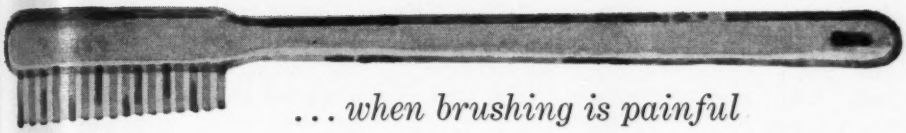
Fluorides and Health

Fluorides must be employed during the period of tooth formation to be of value in preventing dental caries. When fluoride is added in 1 part per million to the drinking water of children under 8 years of age, the total number of carious, missing, and restored permanent teeth may be reduced as much as 65 per cent. These dental benefits often persist into adult life.

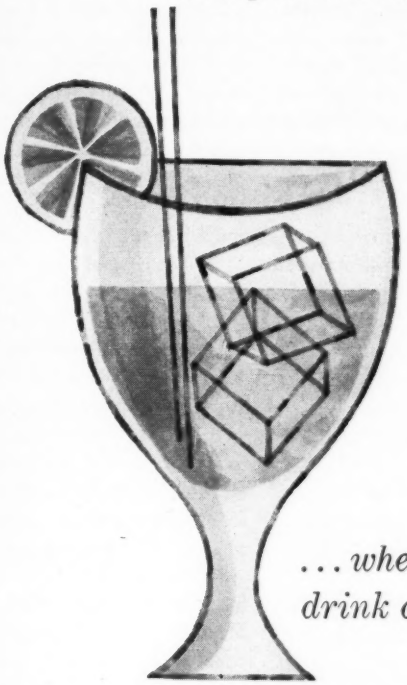
Water containing between 1 and 2 parts per million of fluorine may cause dental mottling. This is difficult to detect and is preferable to the dental defects accompanying insufficient fluorine in the water. Topical application of a 2 per cent sodium fluoride solution to the teeth of children has been of value, but the benefits derived by adults are questionable.

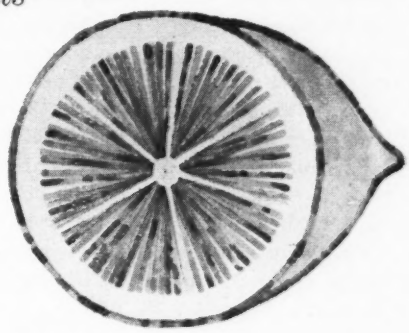
The fluoride intake from water containing 1 part per million (1 milligram per liter) is less than 0.1 milligram per kilogram of body weight per day. This amount apparently produces no demonstrable ill effects. As much as 0.25 grams has been taken orally by human beings, and, except, for nausea without vomiting, no serious effects have resulted.

Prolonged contamination of pasture land grasses by high concentrations of airborne fluorides from nearby industries produces detectable effects in cattle. The levels must approximate or exceed 2.5 milligrams per kilogram of body weight for at least six months to produce dental mottling in cattle with teeth calcifying during the period of exposure. Bony exostoses, radiographic evidence of increased bone density, and coarsened trabeculation also may be noted. The fluoride content of cow's milk, however, does not exceed 0.2 to 0.5 parts per million of fluorine even



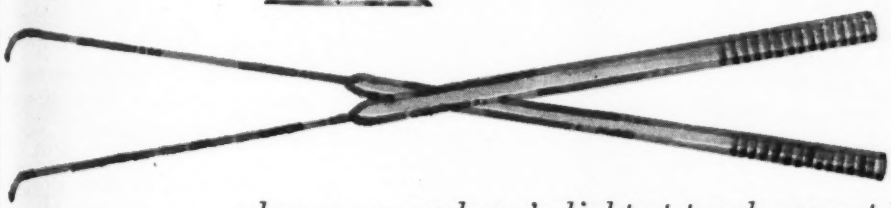
. . . when brushing is painful and poor mouth hygiene results





. . . when acid fruits are not fully enjoyed

. . . when hot or cold food and drink cannot be tolerated



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1. Abel, I.: Oral Surg. *11*:491 (May) 1958.

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when toxic doses are administered over long periods.

Miners of cryolite inhale large amounts of fluoride and bizarre bone changes develop. Population groups using water supplies containing natural fluorides in concentrations ranging from 3 to 8 parts per million do not exhibit such changes. A small percentage of persons exposed to 8 parts of natural fluoride per million in drinking water for long periods of time have radiographic evidence of increased bone density and coarsened trabeculation. Physical or functional effects are not associated with the changes.

Leone, Nicholas: Fluorides in Everyday Life, Texas. J. M. **51**:457-460 (*October*) 1955.

Migraine in Children

Migraine is found in children more frequently than is generally believed. Some aspects of the condition differ from those in adults. Boys are affected more than twice as often as girls. In adults three-fourths of the patients are women. The episodes occur more often in children and the gastrointestinal symptoms are more disturbing than the headaches, Scotomas, perspiration, vascular changes, and edema are less prominent in children. Slight to moderate electroencephalographic dysrhythmias are observed in about two-thirds of children with migraine and in one-third of adults. The condition is familial in about one-half of migrainous children.

In many children emotional disturbances, tensions, and physical fatigue are significant in the precipitation of migraine episodes. Neurologic factors are associated in some children. Approximately 10 per cent have numbness of the arms or the hands.

Other less common disturbances include mental retardation, amnesia, expressive aphasia, hemiplegia, and homonymous hemianopsia. Convulsive disorders may coexist but the attacks of migraine do not resemble the seizures.

About 10 per cent of the children are allergic, but symptoms are not significantly correlated with those of migraine. The age of onset of symptoms varies from 1½ to fourteen years. The most distressing symptoms are nausea and vomiting. Occasionally, prolonged and pronounced vomiting is associated with visual disturbances, as, for example, blurring and photophobia. Frontal or orbital headaches predominate and are almost always accompanied by nausea and vomiting.

Diagnosis depends mainly on recognition of the symptoms. Tension headaches may be difficult to distinguish from migraine.

Aspirin and combined ergotamine and caffeine are recommended for treatment. Aspirin is most effective when administered early in the attack. The oral dose is 1 grain per year of age. Administration of an anticonvulsant may help prevent an attack. Emotional upsets should be avoided.

Burke, Edmund C., and Peters, Gustavus A.: Migraine in Childhood, Dis. Child. **92**:330-336 (*August*) 1956.

Acute Leukemia—Treatment

Detection of leukemia in the early stages is essential, even though the disease is not curable. The sooner treatment is started, the greater is the opportunity to induce a beneficial effect.

The most important factor is a high index of suspicion. Any child with: (1) bone or joint pain, (2) hemorrhagic tendency, (3) repeated infections, or (4) unexplained anemia or fever should have a complete blood and platelet count. If any abnormalities are found or if symptoms persist, bone marrow aspiration is essential.

The total leukocyte count may be high, normal, or low. Normal marrow elements are generally almost completely replaced by leukemic cells. The neoplastic cells infiltrate tissues, bones, and joints.

During remissions, the child appears healthy and the blood and marrow return to normal. Temporary remissions may be produced by folic acid antagonists, purine antagonists, or adrenocortical steroids.

Since folic acid is a more essential nutrient for certain leukemic cells than for normal cells, a folic acid deficiency sufficient to damage only leukemic cells may be produced by administering carefully controlled doses of a folic acid analogue, Methotrexate®. Remissions appear after three to eight weeks of therapy in 20 to 50 per cent of treated children and may last for over a year. Maintenance therapy during a remission is probably preferable. Regardless of whether the drug is continued or stopped, frequent bone marrow examinations are mandatory.

In contrast to the antimetabolites, steroids are rapidly effective. Remissions are apparent among 50 to 70 per cent of patients several days after treatment is started but generally are shorter than with Methotrexate® or Purinethol®. The dosage of cortisone for a child of 5 years is about 150 to 200 milligrams daily in 4 divided oral doses. Short courses are preferable because resistance develops rapidly and the necessary large doses frequently cause undesirable side effects.

In most instances, all three groups of drugs are eventually used. Antimetabolites should be the chief reliance of chemotherapy. Steroids are reserved for special situations, that require use of rapidly effective agents.

Burchenal, Joseph H.; Murphy, M. Lois; and Tan, T. C. Charlotte: Treatment of Acute Leukemia, Pediat. **18**: 643-660 (*September*) 1956.

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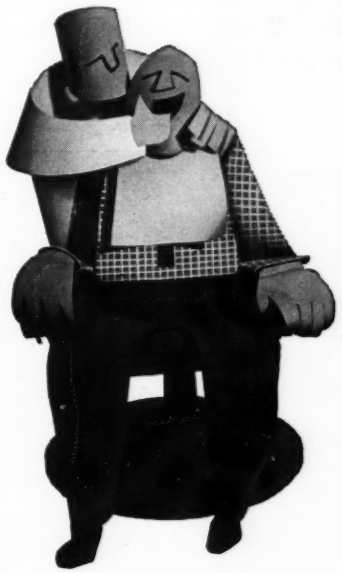

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Our European friends chide us American men that we are too good to our women. It is true that our women have more creature comforts than do the women of other countries: automobiles, fur coats, dishwashing machines, and a galaxy of gadgets. There is no evidence, however, that our women are happier or better adjusted than are the downtrodden women in other societies where they work in the fields and labor long hours without benefit of the machine or of long term mortgages.

My friend, Walter Alvarez, emeritus staff member of the Mayo Clinic and the present distinguished editor of *Modern Medicine*, describes "short mean spells" in woman that are hard to explain except on the basis of cyclic depressions.

Here are the words he uses to describe these cantankerous episodes:

"Probably few physicians realize how many women suffer from what the husbands call 'short mean spells.' Thousands of men will say that the wives usually are attractive, lovable, and charming persons for perhaps a week or ten days and then for twenty-four to forty-eight hours are unpleasant, dissatisfied, and inclined to jump all over them for imaginary misdemeanors. In some women these spells come only at the time of the menstrual periods.

"Often, after the spell the woman is ashamed, contrite, and desirous of forgiveness. She may tell her physician that she had no reason for being unpleasant. Commonly, however, neither wife nor husband mentions these spells to the physician. Neither one cares to talk about them.

"For forty years or more I have heard of these spells but did not know what caused them. Now after the study of many cases I am satisfied that they represent cyclic depressions of short duration. In most cases one or more near relatives of the patient have intermittent typical depressions lasting perhaps a few months. Evidently the short mean spell represents a minor manifestation of the familial tendency to depression." (From *Modern Medicine*, 1 August, 1956.)

Walter Alvarez is a man, a real and vigorous one. Most other men will agree with his description of these "short mean spells." In defense of women, however, I would like to add that "mean spells"—short or long—are not the sole prerogatives of our women. I know men who are ornery, touchy, excitable, moody, suspicious, hypersensitive, irritable, and downright disagreeable in short and in long periods of time. Women have no monopoly on meanness.

Men who are cussed usually rationalize their behavior by blaming

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the pressures and the tensions of their work. A tyrant of an employer, goldbricking employees, demanding customers or clients, nervous and hypercritical patients are among the scapegoats that appear on the masculine table of rationalization. Few men will admit that they are mean because they are unwell or undisciplined.

Women, on the other hand, lean too heavily upon the tides and cycles of their reproductive systems to explain their unpleasant behavior. The girl at puberty is excused for her strange outbursts and conduct. Premenstrual tension is a convenient label that women use to justify a bout of meanness. The pregnant woman can go to almost any length in eccentricity to find an excuse for herself. The menopausal syndrome is a convenient catch-all that women use to explain every ornery action from age 45 to 75. I have noticed that the women who have lived past 75 have run out of sex-tissue explanations and are either well set in cussedness or have risen to the heights of the spirit above meanness.

If Walter Alvarez is correct in saying that "short mean spells" are signs of cyclic depression it would be well to include men as well in these phenomena. Men also suffer from depressions, manic episodes, and the whole constellation of other forms of abnormal behavior.

All human beings are subject to mood swings. In fact, all life processes represent changes and cycles. The changes in the seasons are "moods" of nature. The systole-diastole of the heart are "moods" of the circulation. Wake and sleep are "moods" of consciousness. Hunger and satiety are "moods" of body chemistry. Love and hate are "moods" of affection.

When our moods get out of bounds and we swing too far one way or the other we are *dis-eased* in the full sense of the psychosomatic meaning. If we are elated for too long we are manic; if we are despondent too long we are in a depression.

In the manic-depressive reaction a human being is ill because he swings too far and usually too long into one pole or the other and does not stay long enough in the middle zone of normal and acceptable behavior.

The psychodynamics of the manic-depressive reaction should be understood by *everyone* who treats human beings for any disease. *That definitely includes dentists.* The dentist who has some psychologic orientation can often be the first one to spot the signs of abnormal behavior and direct the patient to a psychiatrist for proper treatment. Furthermore, the dentist who sees his patient in the totality of his personality, rather than in the segment of his oral tissues, is practicing in the fullness of his profession. It is our strongly held belief that the dentist stands in a front-line position in *preventive* medicine.

No better or clearer description of the manic-depressive reaction will be found that that from *The Psychiatric Bulletin* (Spring, 1958):

"Alternate episodes of immoderate elation and severe depression characterize the *manic depressive reaction.* Either extreme of mood may vary in duration from less than a day

Continued on page 322)

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CLINICAL AND LABORATORY SUGGESTIONS

(*See pages* 314 *and* 315)

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to many years, and may recur after intervals of relative stability. Disorder that is characterized by elation or excitement, with logorrhea, rapid thought sequence, and hyperactivity is described as *manic depressive reaction, manic type.* In *manic depressive reaction, depressed type,* depression is characteristic, and psychomotor retardation and apprehension are sometimes discernible. A combination of some of the manifestations of both disturbances is referred to as *mixed type;* and continuous alternation between the two extreme moods is known as *circular type.* . . .

"The mildest form of mania (hypomania) is characterized by overactivity, exaggerated enthusiasm, jocosity, and quick thought association. The individual frequently plans and sometimes executes expansive programs in such pursuits as business enterprise, group organization, and charitable works. He is usually exceedingly affable during this stage, but also is intolerant of criticism, and may become irritable if his judgment is questioned. Hypomanic disorder may not be immediately apparent to the observer who has not known the patient previously.

"The second stage, acute mania, results in intensification of the signs of hypomania. The patient develops psychomotor hyperactivity, elation, and rapid thought sequence or flight of ideas. The constant activity may be so great that food and sleep are often neglected. The patient may use profane and obscene language, and indulge in alcoholic and sexual excesses. Although intelligence, orientation, and memory remain essentially intact, restraint is absent, and the patient may act upon grandiose schemes, make unwise investments, and purchase useless, expensive objects. Despite the general elation, the patient may have momentary depression with crying, or may become combative, destructive, and easily enraged. He is easily distractible, however, and outbursts of antagonism can be diverted, but not prevented.

"The third stage is that of delirious

(*Continued on page* 324)

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mania which is characterized by disorientation. Hallucinations and delusions are not uncommon, and the state is one of intense, sustained excitement, frenzied activity, and incoherence. Distractibility is such that neither sentences nor simple activities can be completed before the succeeding ones are started. This state may result in loss of environmental contact, physical exhaustion, and collapse, sometimes complicated by cardiac and respiratory difficulties.

"The stages that precede the depressed phase of manic depressive reaction are, symptomatically, opposite to those in manic phase. Mild depression is characterized by psychomotor inhibition, slowed thought processes, and depressive affect. Patients frequently complain of fatigue, sleeplessness, dyspepsia, and constipation. Self-blame, anxiety, feelings of inadequacy, and suicidal ideas may also be expressed. There is decreased interest in activities, and even the small undertakings of a daily routine may seem overwhelming."

In this description of the manic-depressive reaction there is nothing to suggest that either alternate episode is an exclusive reaction of women. The feminine personal pronoun "she" is completely lacking in the quotation from The *Psychiatric Bulletin*. The "short mean spell," or the long, or the intermediate are common to both sexes. The same is true for all the forms of mental disease, from quirks of behavior to complete madness.

I realize that few women will be reading this column from a professional magazine, so I cannot be accused of playing to the feminine side of the grandstand. I am suggesting that we "be kind to our women" in the hope and expectation that by such action they will follow our grand, and good, and generous example and be good to us men. —E. J. R.

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Calculus

Dear Editor: I have read and reread your editorial (THE EDITOR'S PAGE, January 1958) on calculus. It is undoubtedly the best description of the subject ever put together. How about a condensed version on a large card:

What is calculus?.....
How formed?.....
Accepted facts.....
Treatment .....

Thanks for a fine article.

William Borden, D.D.S.
717 Bankers Trust Building
Indianapolis, Indiana

No Relation Between Water Fluoride and the Extent Of Strontium Deposition

Dear Editor: Since Doctor Kerwin's article in the February issue of DENTAL DIGEST has aroused considerable concern, I should like to make a few comments. Doctor Kerwin implies that water fluoridation is hazardous because fluoride may increase body deposition of radioactive strontium by combining with Strontium to form highly insoluble strontium fluoride. It can be positively stated that this reaction cannot occur and that fluoridation of the water supply does not influence the uptake of strontium.

We have studied the acquisition of strontium by teeth from areas with fluoride in the water supply ranging from only traces to 5 parts per million, and find that there is no relation between water fluoride and the extent of strontium deposition. In fact, our findings shows that teeth from high fluoride areas may contain minimal amounts of strontium compared to teeth from low fluoride

(*Continued on page* 326)

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areas. On the basis of our results and data in the literature it can be concluded beyond doubt that there is no relation between the presence of strontium and fluoride in calcified structures. The uptake of strontium, like fluoride, depends on the concentrations available, and the depositions of the two elements are separate and independent phenomena.

Doctor Kerwin's position on the question of strontium and his implication that it combines with fluoride in the body to form strontium fluoride is untenable. The blood levels of strontium and fluoride have been established, and it is known that many times greater concentrations of fluoride and strontium would be needed for strontium fluoride to form than is present, even when highly toxic amounts of these elements are ingested. Actually strontium fluoride is not highly insoluble, as Doctor Kerwin asserts. It is approximately eight times more soluble than calcium fluoride, and since blood contains roughly 2000 times more calcium than strontium one would expect calcium fluoride and not strontium fluoride to form. However, the blood concentrations of even calcium and fluoride are not great enough for this reaction to take place, and calcium fluoride is not deposited in the tissues. Instead fluoride enters the bone crystal by taking the place previously occupied by hydroxyl group, while strontium exchanges with calcium an entirely different reaction. The calcium strontium exchange is thus separate from the fluoride hydroxyl exchange. The strontium deposition Doctor Kerwin describes cannot take place.

It is unfortunate that Doctor Kerwin has confused the issue of water fluoridation by falsely associating it with the danger of Strontium^{90} fallout from bomb testing. On issues which so deeply concern public welfare it is essential that only factual information be considered and that concepts be based on sound principles. To create doubts by raising unwarranted questions regarding water fluoridation and needlessly arousing the fears of those who are concerned with the hazards of radiation from strontium is, I believe, a disservice to the public.

Finn Brudevold, D.D.S.
Director of Research
Eastman Dental Dispensary
800 Main Street, East
Rochester 3, New York

Fluoridation will not Increase Radiation Hazard from Strontium^{90}

Dear Editor: Kerwin[1] has published some speculations concerning the interrelations between fluoridation of water supplies and radiation hazard caused by Strontium^{90}. He states: "If, however, fluoride has been consumed, for example, from artificially fluoridated drinking water, then the Strontium^{90} and the fluoride may precipitate as the highly insoluble $Sr^{90}F_2$ within the body."

Although SrF_2 (including $Sr^{90}F_2$) is highly insoluble, CaF_2 is seven times less soluble. Nevertheless, there is no evidence whatsoever that either CaF_2 or SrF_2 can precipitate within the human body as a result of normal, or even abnormal, metabolic conditions involving prolonged intake of fluorides even if the fluoride intake is many times as great as the proposed additions to water supplies.

On the contrary, both fluorine and strontium are deposited in the hard tissues in the form of a complex hydrated calcium carbonate phosphate which has a crystal structure similar to, but not identical with, that of the mineral fluorapatite ($Ca_{10}F_2(PO_4)_6$).[2] The replacement of a small number of the calcium ions by strontium ions is a well-known and clearly understood crystal-chemical phenomenon called isomorphic substitution or diadochy.[3]

It is a matter of common knowledge among crystal chemists and crystallographers that the strontium ion

(*Continued on page* 328)

[1]Kerwin, J. G.: Possible Biologic Hazards of Strontium^{90} and Fluoridation DENTAL DIGEST **64**:58-61 (February) 1958.

[2]Gruner, J. W.; McConnell, D.; and Armstrong, W. D.: The Relationship Between Crystal Structure and Chemical Composition of Enamel and Dentine, J. Biol. Chem. **121**:771-781, 1937.

[3]For a brief introduction to this subject as applied to *apatite*, see this entry in the latest edition of the *Encyclopaedia Britannica*.

[4]McConnell, Duncan: The Crystal Chemistry of Carbonate Apatites and Their Relationships to the Composition of Calcified Tissues, J. Dental Research **31**:53-63 (Dec.) 1952.

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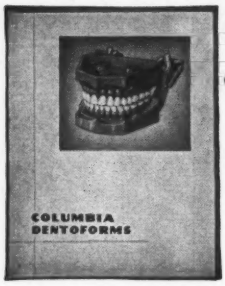

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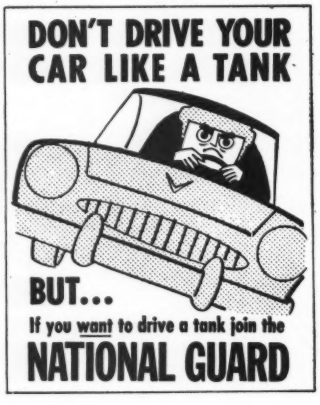

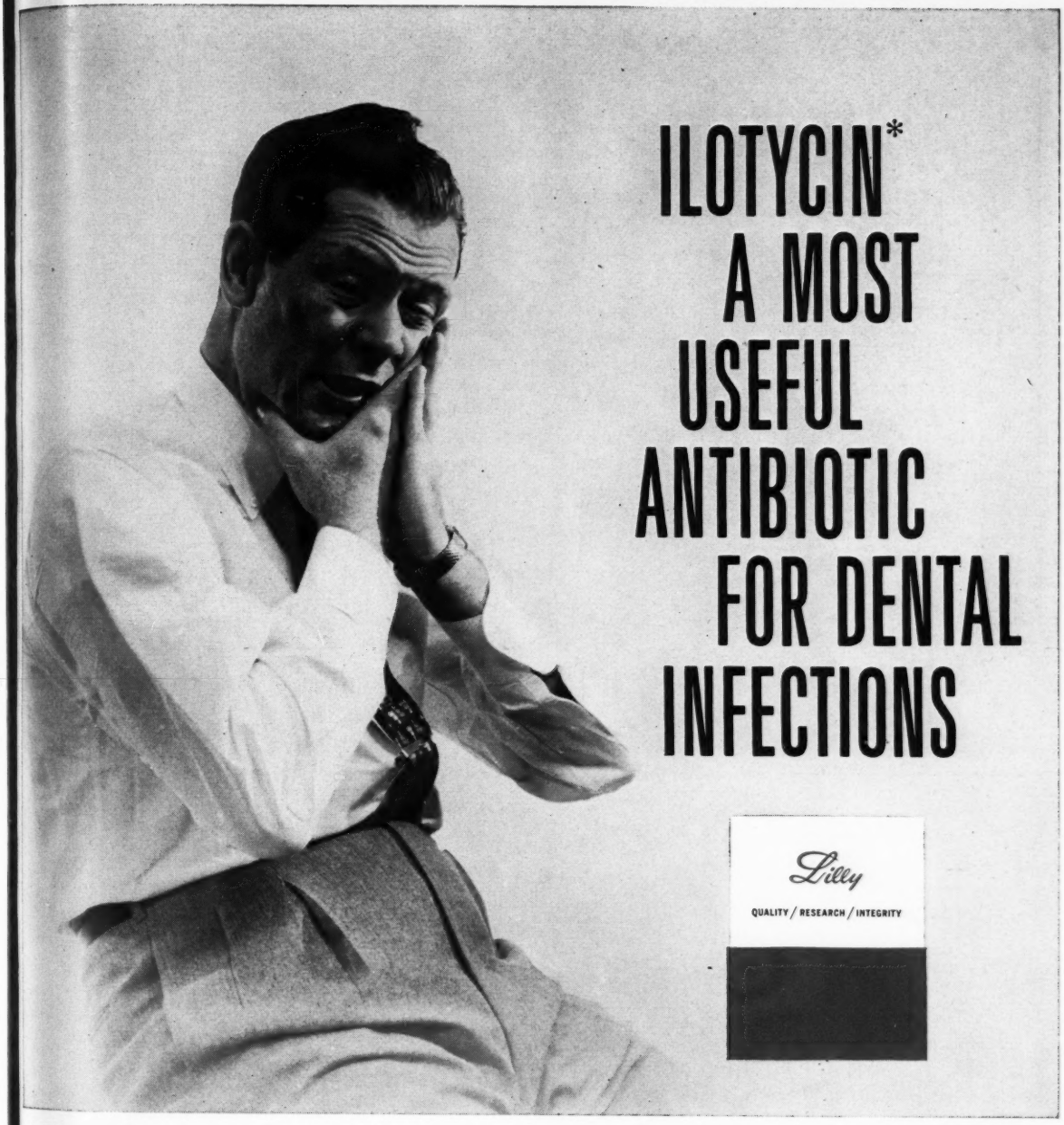

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has a radius significantly larger than that of the calcium ion. Furthermore, it has been demonstrated[4] that the crystal lattice dimensions of fluorine-containing carbonate apatites are not only smaller than the nonfluorine-containing varieties but are even smaller than that of fluorapatite (on a volume basis). Therefore, the accumulation of strontium (with a large ionic radius) would be expected to be incompatible with the smaller framework of the fluorine-containing substance.

For these reasons Kerwin's speculations are incompatible with acceptable general theory. The insolubility of SrF_2 has nothing whatever to do with the accumulation or retention of strontium physiologically. Examination of the best available evidence on the methods of deposition of fluorine and strontium during biochemical processes indicate that, if any prognosis can be made, the radiation hazard from Sr^{90} might be *decreased* rather than increased in the presence of increased quantities of fluorides.

Duncan McConnell, Ph.D.
Hamilton B. G. Robinson, D.D.S.
Ohio State University

Pain and Character

Dear Editor: I am taking your advice in your recent article "How Much Does it Cost to Write a Letter?" to tell you how much I enjoy your CONTRA-ANGLES in DENTAL DIGEST.

In this article you mention C. N. Johnson. If I am not mistaken he wrote some thirty years ago against the use of procaine in cavity preparations on the basis that the suffering of pain builds character.

What do you think would happen if someone came out with a proposition like that nowadays?

Xen. Kakouros, D.D.S.
422 West 9th Street
Erie, Pennsylvania

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